FINAL WORK PLAN

FOR WATERSHED PROTECTION, FLOOD PREVENTION,
AND MUNICIPAL AND INDUSTRIAL WATER SUPPLY

SOUTH FORK WATERSHED

Montgomery County, Arkansas

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

ADDENDUM
MARCH 1975

SOUTH FORK WATERSHED

MONTGOMERY COUNTY
ARKANSAS

SOUTH FORK WATERSHED
ARKANSAS

CONTENTS

Introduction

Part 1 — Discount rate comparison.

Part 2 — Display of impacts to national economic development, environmental quality, regional development, and social well-being accounts.

Part 3 — Display of abridged environmental quality plan.

March 1975

INTRODUCTION

SOUTH FORK WATERSHED
ARKANSAS

This addendum is based on the Water Resources Council's Principles and Standards for Planning.

Effects resulting from the selected work plan alternative are displayed under separate accounts for National Economic Development, Environmental Quality, Regional Development, and Social Well-Being.

The abridged environmental quality plan has been developed by an interdisciplinary team using information and data assembled during investigations and analysis of the South Fork Watershed work plan.

March 1975

SELECTED ALTERNATIVE

DISCOUNT RATE COMPARISON

SOUTH FORK WATERSHED
ARKANSAS

This addendum shows the results of using an interest rate of 6-1/8 percent, current normalized prices, and current construction costs.

Average annual benefits	$143,100
Annual cost	113,915
Benefit cost ratio including secondary benefits	1.3:1
Benefit cost ratio excluding secondary benefits	1.1:1

SELECTED ALTERNATIVE

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

SOUTH FORK WATERSHED
ARKANSAS

Components	Measures of effects 1/ (dollars)
Beneficial effects:	
A. The value to users of increased output of goods and services	
1. Flood prevention	81,030
2. Municipal water supply	34,830
3. Utilization of unemployed and underemployed labor resources	-
Project construction and OM&R	13,770
Total beneficial effects	129,630

Components	Measures of effects 1/ (dollars)
Adverse effects:	
A. The value of resources required for a plan	
1. Multiple purpose structure and floodwater retarding structures	
Project installation (structural measures)	91,160
Project administration	16,460
OM&R	1,800
Total adverse effects	109,420
Net beneficial effects	20,210

1/ Average annual at 5 7/8 percent for 100 years.

SOUTH FORK WATERSHED

Selected Plan

Environmental Quality Account

Components

Beneficial and adverse effects:

A. Areas of natural beauty.	1. Store 180 acre-feet of water to be used for low-flow augmentation. It will be released at an average flow rate of 0.85 cfs.
	2. Create 3 lakes with a total surface area of 193 acres of still, clear, high quality water.
	3. Inundate 22 acres of grassland, 171 acres of forest land and 5 miles of natural stream fish habitat.
	4. Convert 30 acres of grassland and 86 acres of forest land to embankments, spillways, and borrow areas.
	5. Enhance the beauty of the national forest land by controlling erosion on areas with critical stabilization problems.
B. Quality considerations of water, land, and air resources.	1. Provide an adequate high quality water supply (2,000,000 gpd) for the Mount Ida area.
	2. Reduce flooding on 1,606 acres by 62 percent and reduce sediment yield by 17,400 tons per year.
	3. Reduce stream pollution from sediment by decreasing the average annual sediment concentration from 188 mg/l to approximately 96 mg/l.

	4. Preserve the soil resources of the watershed by conservation land treatment measures and flood control.
	5. Increase sedimentation and noise pollution during construction in a normally tranquil environment.
C. Biological resources and selected ecosystems.	1. Enhance stream fish habitat by reducing sediment and increasing low flows.
	2. Improve wildlife habitat diversity in the national forest by harvesting small areas.
	3. Create 193 acres of lake fish and waterfowl habitat.
	4. Improve stream fishery downstream from the structures by low-flow augmentation.
	5. Alter 309 acres of upland wildlife habitat and 5 miles of stream fishery. This acreage supports 25 annual man-days of hunting.
D. Irreversible or irretrievable commitments.	1. Convert 22 acres of grassland and 194 acres of forest land to 193 acres of pools and 23 acres of embankments and spillways.
	2. Commit labor, fuel, material, and equipment to the project.

SELECTED ALTERNATIVE

REGIONAL DEVELOPMENT ACCOUNT

SOUTH FORK WATERSHED
ARKANSAS

Components	Measures of effects 1/ State of Arkansas	Measures of effects 1/ Rest of Nation
	------ dollars ------	
A. Income		
Beneficial effects:		
1. The value to users of increased output of goods and services		
a. Flood prevention	81,030	-
b. Municipal water supply	34,830	-
c. Utilization regional unemployed or underemployed labor resources		
Project construction and OM&R	13,770	-
d. Secondary	12,200	-
Total beneficial effects	141,830	-

Components	Measures of effects 1/ State of Arkansas	Measures of effects 1/ Rest of Nation
	------ dollars ------	
A. Income		
Adverse effects:		
1. The value of resources contributed from within the region to achieve the outputs		
a. Multiple purpose structure and floodwater retarding structures		
Project installation (structural measures)	23,190	67,970
Project administration	1,100	15,360
OM&R	1,800	-
Total adverse effects	25,690	83,730
Net beneficial effects	116,140	-83,730

1/ Average annual at 5 7/8 percent for 100 years.

SELECTED ALTERNATIVE

REGIONAL DEVELOPMENT ACCOUNT (Continued)

SOUTH FORK WATERSHED
ARKANSAS

Components	Measure of effects: State of Arkansas	Measure of effects: Rest of Nation
B. Employment		
Beneficial effects:		
1. Increase in number and types of jobs		
a. Agricultural employment	Utilization of 8-man-years of employment in agricultural production	-
b. Employment for project construction	24 semi-skilled jobs for 5 years	-
c. Employment for project OM&R	0.30 permanent semi-skilled jobs	-
d. Employment in induced activities	42 permanent semi-skilled jobs	-
Total beneficial effects	24 semi-skilled jobs for 5 years	-
	50.30 permanent semi-skilled jobs	-

Components	Measure of effects: State of Arkansas	Measure of effects: Rest of Nation
B. Employment		
Adverse effects:		
1. Decrease in number and types of jobs		
a. Lost in agricultural employment in project take area	1-man-year of agricultural employment	-
Total adverse effects	1 permanent semi-skilled job	-
Net beneficial effects	24 semi-skilled jobs for 5 years	-
	49.30 permanent semi-skilled jobs	-

SELECTED ALTERNATIVE

REGIONAL DEVELOPMENT ACCOUNT (Continued)

SOUTH FORK WATERSHED
ARKANSAS

Components	State of Arkansas	Measures of effects	Rest of Nation
C. Population Distribution			
Beneficial effects:	Creates 24 semi-skilled jobs for 5 years. Creates 50.30 permanent semi-skilled jobs. Population of Montgomery County increased .084 percent from 1960 to 1970.		-
Adverse effects:	-		-
D. Regional economic base and stability			
Beneficial effects:	The project will provide a 71 percent reduction in average annual flood damage in an area where agriculture is the economic mainstay. Flood protection is an integral part of the success of other programs which are underway for the economic development of the area. Storage is included in Multiple Purpose Structure Number 1 for municipal and industrial water for the City of Mount Ida. The project creates 24 semi-skilled jobs and 50.30 permanent semi-skilled jobs. The unemployment rate for Montgomery County is 6.9 percent. Montgomery County is eligible to receive assistance under Title IV and V of the Economic Development Act of 1965.		-

SELECTED ALTERNATIVE

SOCIAL WELL-BEING ACCOUNT

SOUTH FORK WATERSHED
ARKANSAS

Components	Measures of effects
Beneficial and adverse effects:	
A. Real income distribution	1. Creates a net of 73.30 low to medium income jobs for area residents. There will be 49.30 permanent semi-skilled jobs. There will be 24 semi-skilled jobs for 5 years.
	2. Create regional income benefit distribution of $141,830 by income class as follows:

Income Class (dollars)	Percentage of Adjusted Gross Income in Class	Percentage of Benefits in Class
Less than 3,000	28	30
3,000 - 10,000	56	60
More than 10,000	16	10

SELECTED ALTERNATIVE

SOCIAL WELL-BEING ACCOUNT (Continued)

SOUTH FORK WATERSHED
ARKANSAS

Components	Measures of effects
	3. Local costs to be borne by region total $26,080 with distribution by income class as follows:

Income Class (dollars)	Percentage of Adjusted Gross Income in Class	Percentage of Contribution in Class
Less than 3,000	28	25
3,000 - 10,000	56	70
More than 10,000	16	5

B. Life, health, and safety	1. Provide a 62 percent reduction in average annual area flooded on 1,606 acres of flood plain. There are about 25 farms in the flood plain. Flood plain land is valued at about $300 per acre. Storage is included in Multiple Purpose Structure Number 1 for municipal and industrial water for the City of Mount Ida. There are 41 acres in the City of Mount Ida subject to flooding from the 100-year frequency flood and 11 properties are subject to damage. An additional 112 acres (including six properties) are subject to flooding in the remainder of the flood plain on the north side of the river adjacent to Mount Ida. Damages to the above properties will be reduced 79 and 94 percent, respectively. Of the 153 acres, 10 acres are currently in urban development. The 1,596-acre agricultural area will receive a 70 percent reduction in average annual damages.

SOUTH FORK WATERSHED
ENVIRONMENTAL QUALITY PLAN

(ABRIDGED)

Problems and Component Needs

The major environmental problem in the watershed is the lack of variety of wildlife habitat. Sixty-four percent of the watershed lies within the Ouachita National Forest. The Forest Service has prepared a regeneration plan for forested lands within the national forest. The implementation of this plan is not scheduled during the installation period of the project. Many areas within the forest are not readily accessible. The existing road system is made up of predominantly dirt or gravel roads. Most road crossings at drainageways in the upper part of the watershed are low water fords. These crossings are impassable for short periods of high rainfall. Recreation facilities have not been developed in this portion of the Ouachita National Forest.

The component needs to meet environmental objectives include: (1) The creation of a wider variety of wildlife habitat in a forest ecosystem by regeneration practices on five 50-acre plots annually; (2) The development of 15 miles of marked foot trails for the improved access to 500 acres of unique geological "rock land" and 7,000 acres of natural forest beauty for human enjoyment; (3) The application of dust suppressants and bridge construction so that touring motorists can fully enjoy the natural beauty of the clear mountain streams in a natural forest setting under a wider variety of conditions; and (4) Development of picnicking and camping facilities so that a wider variety of uses can be made of the mountain forested resource for man's enjoyment at any hour during the day or night.

Description of the Plan Elements, Cost, and Implementation

The U. S. Forest Service plans to institute a regeneration program on national forest land in the watershed. Regeneration involves harvest of 50-acre areas on a schedule whereby complete regeneration is accomplished over a 100-year period. The Forest Service has agreed to include the watershed in their program and this will not result in additional costs. A landscape architect will design the areas to blend with the natural landscape.

Dust suppressants could be applied to roads during dry periods when dust becomes a nuisance. This could be accomplished at an annual cost of about $4,500. Bridges, (rustic type to blend with the landscape), could be installed at an average cost of about $50,000 each. About eight bridges are needed. The development of 15 miles of foot trails would provide hiking access to the remote parts of the watershed where the forest serenity

values are the greatest. The trails would cost about $80,000. Camping and picnicking facilities, which would include safe drinking water and sanitary facilities, would be located at three locations. These could be installed and maintained at a cost of about $240,000 but such developments (including trails) are not presently planned. Detailed studies of demand and costs would be needed to determine if these proposals could be justified. However, access roads to the regeneration areas could be used by visitors for foot travel to more remote parts of the watershed.

Environmental Effect from the Environmental Quality Plan

Generally the plan provides for a more complete commune of humans with nature in a forested mountain setting. Any increase in visitations will increase litter and detract from the tranquility of the area. During the early years of the regenerating areas, the scenic values of the forest will be greatly reduced, but the increased variety of wildlife that could be observed would partially compensate the loss. The timber harvested from the forest resource would provide additional benefits to people of the area. The picnicking and camping facilities could be located on the mountain ridge, and in the valleys where large areas of landscape could be viewed and clear flowing streams could be enjoyed.

TABLE OF CONTENTS

	Page
WATERSHED WORK PLAN AGREEMENT	i
SUMMARY OF PLAN	1
WATERSHED RESOURCES-ENVIRONMENTAL SETTING	3
Physical Resources	3
Present and Projected Population	10
Economic Resources	12
Plant and Animal Resources	13
Recreational Resources	16
Archeological and Historical Resources	16
Soil, Water, and Plant Management Status	16
WATER AND RELATED LAND RESOURCE PROBLEMS	17
Land and Water Management	17
Floodwater Damage	17
Erosion Damage	19
Sediment Damage	19
Drainage Problems	20
Municipal and Industrial Water Problems	20
Plant and Animal Problems	20
Water Quality Problems	21
Economic and Social	21
PROJECTS OF OTHER AGENCIES	21
PROJECT FORMULATION	22
Objectives	23
Environmental Considerations	24
Alternatives	25
WORKS OF IMPROVEMENT TO BE INSTALLED	28
Land Treatment Measures	28
Structural Measures	29
EXPLANATION OF INSTALLATION COSTS	35
EFFECTS OF WORKS OF IMPROVEMENT	39
Flood Prevention, Erosion, and Sediment	39
Water Supply	42
Fish and Wildlife and Recreation	43
Archeological and Historical Resources	44
Economic and Social	44
PROJECT BENEFITS	45
COMPARISON OF BENEFITS AND COSTS	47

TABLE OF CONTENTS (continued)

	Page
PROJECT INSTALLATION	47
FINANCING PROJECT INSTALLATION	49
PROVISIONS FOR OPERATION AND MAINTENANCE	50
TABLES	
Table 1 - Estimated Project Installation Cost	53
Table 1A - Status of Watershed Works of Improvement	55
Table 2 - Estimated Structural Cost Distribution	56
Table 2A - Cost Allocation and Cost Sharing Summary	57
Table 3 - Structural Data - Structures with Planned Storage Capacity	58
Table 4 - Annual Cost	59
Table 5 - Estimated Annual Flood Damage Reduction Benefits	60
Table 6 - Comparison of Benefits and Costs for Structural Measures	61
INVESTIGATION AND ANALYSES	62
Land Treatment	62
Engineering	62
Geologic	63
Sedimentation	64
Hydraulic and Hydrologic	64
Economic	66
Fish and Wildlife	68
LITERATURE CITED	69

FIGURES

Figure 1 - Section of Typical Floodwater Retarding Structure
Figure 1A - Section of a Typical Multiple Purpose Structure
Figure 2 - Typical Floodwater Retarding Structure, General Plan and Profile
Figure 2A - Typical Floodwater Retarding Structure, Structure Plan and Section
Figure 2B - Urban Flood Plain
Figure 3 - Project Map

WATERSHED WORK PLAN AGREEMENT

between the

Montgomery County Conservation District
Local Organization

City of Mount Ida
Local Organization

Arkansas Soil and Water Conservation Commission
Local Organization

(hereinafter referred to as the Sponsoring Local Organization)

State of Arkansas

and the

Soil Conservation Service
United States Department of Agriculture
(hereinafter referred to as the Service)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organization for assistance in preparing a plan for works of improvement for the South Fork Watershed, State of Arkansas, under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Statute 666), as amended; and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organization and the Service a mutually satisfactory plan for works of improvement for the South Fork Watershed, State of Arkansas, hereinafter referred to as the watershed work plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organization and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree that the works of improvement as set forth in said plan can be installed in about five years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms, conditions, and stipulations provided for in the watershed work plan:

1. The Sponsoring Local Organization will acquire, with other than Public Law 566 funds, such land rights as will be needed in connection with the works of improvement. (Estimated Cost $87,000). The Sponsors will secure special use permits from the U. S. Forest Service prior to the construction of improvements involving national forest lands.

2. The Sponsoring Local Organization assures that comparable replacement dwellings will be available for individuals and persons displaced from dwellings, and will provide relocation assistance advisory services and relocation assistance, make the relocation payments to displaced persons, and otherwise comply with the real property acquisition policies contained in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Statute 1894) effective as of January 2, 1971, and the Regulations issued by the Secretary of Agriculture pursuant thereto. The costs of relocation payments will be shared by the Sponsoring Local Organization and the Service as follows:

	Sponsoring Local Organization (percent)	Service (percent)	Estimated Relocation Payment Costs (dollars)
Relocation Payments	26.6	73.4	0 1/

1/ Investigation has disclosed that under present conditions the project measures will not result in the displacement of any person, business, or farm operation. However, if relocations become necessary, relocation payments will be cost-shared in accordance with the percentages shown.

3. The Sponsoring Local Organization will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to State law as may be needed in the installation and operation of the works of improvement.

4. The percentages of construction costs of structural measures to be paid by he Sponsoring Local Organization and by the Service are as follows:

Works of Improvement	Sponsoring Local Organization (percent)	Service (percent)	Estimated Construction Costs (dollars)
Multiple Purpose Structure Number 1	39.89	60.11	418,000
Intake Structure and Raw Water Line	100.00	0	114,500
Floodwater Retarding Structures Numbers 2 and 3	0	100.00	807,300

5. The percentages of the engineering costs to be borne by the Sponsoring Local Organization and the Service are as follows:

Works of Improvement	Sponsoring Local Organization (percent)	Service (percent)	Estimated Engineering Costs (dollars)
Multiple Purpose Structure Number 1	39.89	60.11	37,300
Intake Structure and Raw Water Line	100.00	0	10,200
Floodwater Retarding Structures Numbers 2 and 3	0	100.00	72,100

6. The Sponsoring Local Organization and the Service will each bear the costs of Project Administration which they incur, estimated to be $18,600 and $260,700, respectively.

7. The Sponsoring Local Organization will obtain agreements from owners of not less than 50 percent of the land above each reservoir and floodwater retarding structure that they will carry out conservation farm or ranch plans on their land.

8. The Sponsoring Local Organization will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.

9. The Sponsoring Local Organization will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

10. The Sponsoring Local Organization will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

11. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

12. This agreement is not a fund obligating document. Financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the availability of appropriations for this purpose.

    A separate agreement will be entered into between the Service and the Sponsoring Local Organization before either party initiates work involving funds of the other party. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific work of improvement.

13. The watershed work plan may be amended or revised, and this agreement may be modified or terminated only by mutual agreement of the parties hereto except for cause. The Service may terminate financial and other assistance in whole, or in part, at any time whenever it is determined that the Sponsoring Local Organization has failed to comply with the conditions of this agreement. The Service shall promptly notify the Sponsoring Local Organization in writing of the determination and the reasons for the termination, together with the effective date. Payments made to the Sponsoring Local Organization or recoveries by the Service under projects terminated for cause shall be in accord with the legal rights and liabilities of the parties. An amendment to incorporate changes affecting one specific structural measure may be made by mutual agreement between the Service and the sponsors having specific responsibilities for the particular structural measure involved.

14. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

15. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act

of 1964 and the regulations of the Secretary of Agriculture (7 C.F.R. Section 15.1-15.12), which provide that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any activity receiving federal financial assistance.

16. This agreement will not become effective until the Service has issued a notification of approval and authorizes assistance.

Montgomery County Conservation District
Local Organization

By Mearl C. Robins

Title Chairman

Mount Ida, AR 71957
Address Zip Code

Date 11-21-75

The signing of this agreement was authorized by a resolution of the governing body of the Montgomery County Conservation District
Local Organization

adopted at a meeting held on 11-21-75

Bill Watkins
Secretary, Local Organization

Mount Ida, AR 71957
Address Zip Code

Date 11-21-75

City of Mount Ida
Local Organization

By Mearl C. Robins

Title Mayor

Mount Ida, AR 71957
Address Zip Code

Date 11-21-75

The signing of this agreement was authorized by a resolution of the governing body of the City of Mount Ida, Arkansas
Local Organization

adopted at a meeting held on 11-21-75

George W. Beall
Secretary, Local Organization

Mount Ida, AR 71957
Address Zip Code

Date 11-21-75

Arkansas Soil and Water Conservation Commission
Local Organization

By John Luce

Title Chairman

1200 West Park Drive Room 308
Little Rock, Arkansas 72204
Address Zip Code

Date 12-4-75

The signing of this agreement was authorized by a resolution of the Arkansas Soil and Water Conservation Commission adopted at a meeting held
Local Organization
on Date Project Approved - February 27, 1974.

John P. Saxton
Executive Director, Arkansas Soil & Water Conservation Commission

1200 West Park Drive, Room 308
Little Rock, Arkansas 72204
Address Zip Code

Date 12-8-75

Appropriate and careful consideration has been given to the environmental impact statement prepared for this project and to the environmental aspects thereof.

Soil Conservation Service
United States Department of Agriculture

Approved by:

State Conservationist

12-9-75
Date

FINAL WATERSHED WORK PLAN

FOR

WATERSHED PROTECTION, FLOOD PREVENTION, AND MUNICIPAL AND INDUSTRIAL WATER SUPPLY

SOUTH FORK WATERSHED

Montgomery County, Arkansas

Prepared under the Authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Statute 666), as amended.

Prepared By:

Montgomery County Conservation District
Box 236, Mount Ida, Arkansas 71957

The City of Mount Ida
Mount Ida, Arkansas 71957

Arkansas Soil and Water Conservation Commission
Little Rock, Arkansas 72201

With Assistance By:

United States Department of Agriculture
Soil Conservation Service
Forest Service

State of Arkansas
Department of Commerce
Division of Soil and Water Resources

March 1975

WATERSHED WORK PLAN

SOUTH FORK WATERSHED

Montgomery County, Arkansas

March 1975

SUMMARY OF PLAN

South Fork Watershed comprises 44,851 acres in Montgomery County in west-central Arkansas. The City of Mount Ida (population 819) is in the watershed. The South Fork Ouachita River flows from the southwest part of the watershed to the watershed outlet, which is about 3 miles above Lake Ouachita.

The work plan for watershed protection, flood prevention, and municipal and industrial water supply was prepared by the Montgomery County Conservation District, the City of Mount Ida, and the Arkansas Soil and Water Conservation Commission as the sponsoring local organizations. Technical assistance was furnished by the United States Department of Agriculture, Soil Conservation Service and Forest Service. Financial assistance in the development of the plan was provided by the State of Arkansas, Department of Commerce, Division of Soil and Water Resources.

The watershed is in the Ouachita Mountains Land Resource Area. The upland part of the watershed is mountainous where the tributary streams have steep gradients that pass through narrow valleys to the main streams. Elevations range from about 600 to 1,700 feet above mean sea level. Geologic formations underlying the watershed are shale, sandstone, and limestone of Cambrian and Ordovician ages.

The 85 farms in the watershed average about 175 acres. The watershed flood plain is 1,606 acres subject to flood damage as delineated by the 100-year frequency flood. Flood prevention benefits will accrue to the landowners and operators of 25 farms in the flood plain. Average annual flood damages are estimated to be $98,970.

A dependable supply of water will be afforded the City of Mount Ida (population 819) by the inclusion of 1,352 acre-feet of storage in Multiple Purpose Structure Number 1. The Montgomery County Rural Water Users Association plans to install a water distribution system to serve about 200 families.

The project will contribute to the economic goals of the West Central Arkansas Planning and Development District and Ozarks Economic Development Region by developing, conserving, improving, and utilizing the natural resources of the area to enhance the economic and social welfare of the area's residents.

The work plan proposes the installation of land treatment and structural works of improvement to be accomplished during a 5-year installation period. The total estimated cost of the project is $1,951,600, of which $1,432,480 will be borne by Public Law 566 funds and $519,120 will be borne by other funds.

Total land treatment costs are $125,900. Land treatment measures on the private land will be installed and maintained by the owners and operators with assistance from federal and state agencies at an estimated cost of $79,540. Additional land treatment measures will be applied on national forest land at an estimated cost of $46,360. In recent years, land treatment measures have been applied on both private and federal land at an estimated cost of $125,336 (Table 1A).

Structural measures consist of one multiple purpose structure (flood prevention and municipal and industrial water supply) and two floodwater retarding structures. The total estimated cost for the installation of structural measures is $1,825,700, of which Public Law 566 funds will pay $1,413,780 and other funds will pay $411,920.

Multiple Purpose Structure Number 1 will be operated and maintained by the City of Mount Ida, Arkansas, at an estimated annual cost of $1,000. Floodwater Retarding Structures Numbers 2 and 3 will be operated and maintained by the Montgomery County Conservation District through the South Fork Improvement Project Area at an estimated annual cost of $800.

Significant effects on the environment will result from the reduction in flooding, erosion rates, runoff rates, and sediment yield.

Low-flow release from Structures Numbers 2 and 3 and municipal and industrial release from Structure Number 1 will augment downstream flow. The downstream water temperatures will be maintained within pre-impoundment ranges by "cool water" intakes in Structures Numbers 2 and 3. Lake fish habitat will be created in the pools of the structures and wildlife habitat will be created on critical areas to be treated.

The structures will require 309 acres of land for pools, embankments, emergency spillways, and offsite borrow areas. Approximately 25 annual man-days of hunting will be lost. The structures will convert 5 miles of natural streams to reservoir areas.

The average annual benefits accruing to structural measures are distributed as follows:

Flood Prevention	
Damage Reduction	$ 66,720
More Intensive Land Use	14,310
Municipal and Industrial Water	34,830
Redevelopment	13,770
Secondary	12,200
Total	$141,830

The average annual cost of structural measures is estimated to be $109,420. The ratio of average annual benefits to average annual cost of structural measures is 1.3 to 1.

The Montgomery County Conservation District through the South Fork Improvement Project Area has the power under State law to secure and repay loans, assess benefits, and levy taxes; and will provide the funds needed to meet its obligations in the installation of the planned structural measures. The district plans to obtain a watershed loan to finance its share of the project installation cost. A letter of intent to borrow has been filed with the Farmers Home Administration. Funds for the repayment of this loan will be obtained from taxes levied on the benefited area. The City of Mount Ida will meet its financial obligations through city revenues or other funds.

WATERSHED RESOURCES - ENVIRONMENTAL SETTING 1/

Physical Resources

The watershed comprises 44,851 acres in Montgomery County in west-central Arkansas. The watershed is about 16 miles long and 5 miles wide and is in the Ouachita Water Resource Subregion of the Lower Mississippi Water Resource Region as delineated by the U. S. Water Resources Council (10). Mount Ida, population 819, is the county seat of Montgomery County, which has a total population of 5,821 (7). All but 1,465 of the county's residents live in unincorporated communities or rural areas. The watershed population is 1,383, which includes 819 in Mount Ida and 564 rural residents. The largest town within 50 miles of the watershed is Hot Springs, population 35,631 (7).

The watershed is in the Ouachita Mountains Land Resource Area (10). The upland part of the watershed is mountainous and the tributary streams have steep gradients that pass through narrow valleys to the main streams. Elevations range from about 600 feet at the watershed outlet to 1,700 feet on Wheeler Mountain, which is 5 miles south of Mount Ida. Most of the mountainous area is between 700 and 1,000 feet above mean sea level.

1/ All information and data, except as otherwise noted, were collected during watershed planning investigation by the Soil Conservation Service and Forest Service, U. S. Department of Agriculture.

The flood plain area is subject to frequent flooding and erosion. The South Fork Ouachita River is unable to provide an adequate and dependable supply of water for the present and future growth of the area.

The watershed is situated near the axis of the Ouachita anticlinorium which is the center portion of the Ouachita Mountain uplift. Bedrock in the watershed is of the oldest strata in the Ouachita Mountains. The strata includes Collier Shale of Cambrian age overlain by Crystal Mountain Sandstone, Mazarn Shale, Blakely Sandstone, Womble Shale, Polk Creek Shale, and Bigfork Chert of Ordovician age.

Mineral resources in the watershed include limestone, slate, and quartz crystals. Limestone is found in the watershed in limited quantities. Limestone was mined at the Pipkin Quarry in the central portion of the watershed until 1951. A crushing plant at the quarry supplied roadstone, chat, and agricultural limestone. An estimated reserve of 100,000 tons of limestone remains in the quarry. Limited quantities of slate are available in the Mazarn Shale or Womble Shale in the southern part of the watershed. The chief use of the slate is for roofing granules. Quartz veins are present in the Crystal Mountain and Blakely Sandstones in the Ouachita Mountains. The most productive zones for quartz mining found to date are outside of the watershed and quartz mining in the watershed has been limited to hand diggings and exploration. The quartz has been used for gem material, mineral collections, tourist trade, optical equipment, and electrical oscillators (4).

About 80 percent of the soils in the watershed is on mountainous areas, 10 percent is on upland benches, and 10 percent is on stream terraces and flood plains.

Soils in the mountainous area are shallow (less than 20 inches) to deep, well-drained, moderately and slowly permeable, rolling to steep, gravelly and stony soils. They formed from steeply inclined, fractured and folded shale and sandstone. The soils are best suited for mixed hardwood and pine forest. A limited area of very shallow (less than 10 inches) rockland occurs as outcrops of folded and fractured shale, quartzite, or sandstone that is poorly suited to plants.

The upland soils are shallow to deep, well and somewhat excessively drained loamy and clayey soils. They formed in weathered sandstone interbedded with thin layers of fractured and tilted shale. They are well suited to shortleaf pine and red oaks. Small areas are suited for cultivated crops.

The nearly level to gently sloping loamy flood plain and stream terrace soils are well and moderately well drained. These soils are well suited to pine, black walnut, sweetgum, and sycamore trees. Some of these soils are well suited for cropland and grassland. Some of the level soils in the flood plain are somewhat poorly to poorly drained.

The land capability classes and subclasses of the soils in the watershed are as follows:

Land Capability Classes and Subclasses 1/	Acres	Percent
IIe	942	2
IIw	1,570	3
IIIw	628	1
IIIe	2,623	6
IVe	1,413	3
VIe	6,548	15
VIIe	16,371	37
VIIs	14,756	33
Total	44,851	100

1/ Refer to Land Capability Classification, USDA, SCS, Agricultural Handbook Number 210, September 1961, for a complete description of land capabilities.

Briefly, the land capability classes (the Roman Numerals) are an interpretation of the suitability of the soil for cultivation and the subclasses (the lower case letters) indicate the most limiting factor in the use of the soil. Class II soils have moderate limitations; Class III soils have severe limitations; and Class IV soils have very severe limitations for crop production. Soils in Classes VI and VII should remain in permanent vegetation such as pasture, hay, or forest.

Subclass "e" indicates a potential erosion hazard because of the nature of the soil or the steepness of the slope. Subclass "w" indicates a limitation in use because of excess water either as overflow or floodwater, ponded surface water, poor internal drainage, a shallow water table, or combinations of these factors. Subclass "s" indicates that the soil is limited mainly because it is shallow, droughty, or stony. Capability classifications can change if the limiting factor is corrected. For example, if flooding is controlled on Class IIIw soil that is frequently flooded, the capability could change to a capability class with fewer limitations, depending upon the degree of flood control and other factors.

The land capability classes and subclasses of the soils in the flood plain are as follows:

Classes and Subclasses	Acres	Percent
IIe	482	30
IIw	803	50
IIIw	321	20
Total	1,606	100

Sufficient quantities of ground water for domestic and nonirrigation farm uses generally are available in the Ouachita Mountains, but only one community that has a population greater than 500 uses ground water for municipal supply. Ground water should not be considered as a source of supply for municipal growth and economic development in the Ouachita Mountains unless the quantity needed is small (14).

Ground water reserves in the watershed are limited to small quantities which occur in gravels, porous sandstones, or highly fractured rock (4).

The streams of the Ouachita Mountains are the best potential source of water for municipal growth and economic development. With adequate storage facilities, surface water is the most reliable and, in many places, the only source of supply when water demands approach 50,000 gallons per day. The streams are utilized for municipal supply by nine of the ten communities in the mountains that have populations greater than 500 (14).

Normal precipitation is 53.90 inches per year with about 27 inches from April through September. Normal monthly rainfall is as follows:

Month	Inches	Month	Inches
January	4.67	July	4.44
February	4.33	August	3.46
March	5.18	September	3.82
April	5.44	October	3.62
May	6.13	November	4.45
June	3.75	December	4.61

The average annual temperature is 61 degrees Fahrenheit with extremes ranging from minus 21 degrees Fahrenheit to 116 degrees Fahrenheit. Temperatures average 41 degrees in January and 80 degrees in July. The average growing season is 202 days from April 10 to October 30.

Land use in the watershed is as follows:

Land Use	Acres	Percent
Cropland	55	0.1
Grassland	3,043	6.8
Forest Land	40,789	90.9
Urban and Built-up	196	0.5
Other Land	768 1/	1.7
Total	44,851	100.0

1/ Includes 742 acres of roads and 26 acres of miscellaneous land.

Ninety-one percent of the watershed is in forest cover. Most of the forest land is in the rolling and mountainous uplands. The higher elevations on the north slopes support upland hardwoods (oak-hickory). The predominant cover on the south slopes and the lower north slopes

is shortleaf pine and pine-hardwoods. The most common tree species in the smaller, scattered forest tracts in the bottom lands are white and red oaks, sweetgum, elm, and blackgum.

About one-fourth, 10,889 acres, of the forested land is in small farm holdings. Weyerhaeuser Company manages four separate tracts of forest land in the watershed totaling 1,100 acres. The remaining forest land, 28,800 acres, is administered by the Forest Service as part of the Ouachita National Forest.

The 1970 Arkansas fire loss index goal was 0.47 percent and watershed protection goal was 0.20 percent. The average percent burn for the watershed for the years 1966 through 1970 was 0.053 percent.

With few exceptions, forests are in fair hydrologic condition. Those in private ownerships tend to be below average. Less than ten percent of the forest area showed light to moderate damage from grazing. None of the forest area is severely overgrazed.

The South Fork Ouachita River flows from the southwest part of the watershed to the watershed outlet, which is about 3 miles upstream from Lake Ouachita. The named tributaries and their drainage areas are North Fork (10 square miles), Big Cedar Creek (6 square miles), Cedar Creek (3 square miles), Woods Branch (3 square miles), Barnes Branch (2 square miles), and Martin Creek (3 square miles). Several small unnamed tributaries (1 to 3 miles long) empty into the South Fork Ouachita River. The flow characteristics of the smaller tributaries are intermittent. Although there are perennial springs present in some of the drainage areas, the flows from these springs are small enough that all the streams will usually cease to flow at some point during a normal year. Practically all the streams are tree-lined. South Fork Ouachita River has not been classified by the Arkansas Department of Pollution Control and Ecology, but has characteristics similar to those of the Ouachita River above Lake Ouachita, which has a Use Class A and Fishery Class S (11). This indicates that the water is suitable for primary contact recreation and other compatible uses and suitable for a smallmouth bass fishery.

The low population density of the watershed, the large percentage of forest land, the small amount of cropland, and the presence of springs are all conducive to the excellent quality of water. The water temperatures are generally cool and the average concentration of sediment (188 milligrams per liter), of dissolved solids, and of other pollutants is low.

South Fork Ouachita River varies from headwater characteristics (steep gradient; bedrock bottom; high riffle percentage; and shallow, infrequent pools) to a middle stream course (gentle gradient; rubble, gravel, and silt bottom; high pool percentage; and moderately deep, frequent pools).

Water quality analyses were made on South Fork Ouachita River near the bridge on U. S. Highway 270 at Mount Ida (Sample Station Number 1) by the U. S. Geological Survey from August 1969 to June 1972 (12). Tests run were dissolved oxygen, pH, specific conductance, and temperature. Other water quality analyses were made in February and April 1974 by the Arkansas Department of Pollution Control and Ecology on Big Cedar Creek approximately one-fourth mile downstream from Structure Number 1 (Sample Station Number 2). Also, in February 1968 the Arkansas State Department of Health made a water quality analysis on South Fork Ouachita River near the Mount Ida municipal intake (Sample Station Number 1). The following summary is the result of these analyses:

WATER QUALITY ANALYSES

Tests	Range	Number of Samples	Log Mean	Arithmetic Mean	Arkansas Water Quality Standards (11)
Iron Fe - mg/l	0.10 - 0.30	3	0.16	0.18	0.30 1/
Manganese Mn - mg/l	0.01 - 0.03	2	0.02	0.02	0.05 1/
Calcium Ca - mg/l	26 - 35	3	31.4	31.7	-
Magnesium Mg - mg/l	5.0 - 9.0	3	6.2	6.4	-
Alkalinity $CaCO_3$ - mg/l	82 - 111	3	103	101	-
Sulfate SO_4 - mg/l	1.0 - 11.0	3	4.7	7.0	10
Chloride Cl - mg/l	0.6 - 4.0	3	1.9	3.0	10
Nitrate N - mg/l	0.1 - 2.8	2	0.5	1.4	10
Phosphate P - mg/l	0.01 - 0.01	2	0.01	0.01	0.10
Total Hardness $CaCO_3$ - mg/l	86 - 126	3	104	106	-
Conductivity Micromhos/cm	132 - 197	30	165	167	-
pH	6.3 - 8.0	30	7.6	7.5	6.0-9.0
Water Temperature ^oC	6.0 - 26.5	29	14.7	16.0	30.0
Color PT - CO Units	1.0 - 5.0	2	2.3	3.0	75
Turbidity JTU	2.5 3.1	2	2.8	2.8	10
Dissolved Oxygen DO - mg/l	6.8 - 12.0	28	9.4	9.3	6.0
Percent Oxygen Saturation	76 - 110	28	92	91	-
BOD 5-day - mg/l	0.6 - 0.7	2	0.66	0.65	-
Fecal Coliform No./100 ml	1 - 8	2	3	4	200
Total Coliform No./100 ml	20 - 42	2	29	31	5,000 1/
Fecal Strep. No./100 ml	1 - 30	2	6	15	-
Total Solids mg/l	130 - 153	3	136	139	-
Dissolved Solids mg/l	130 - 151	2	140	141	150

1/ From Rules and Regulations Pertaining to Public Water Supplies by the Arkansas State Department of Health (13).

During July 1975, five samples were taken at two points and these samples were analyzed for bacterial quality. The two sample stations, mentioned above are shown on the map on page 11. The results of these tests are summarized as follows:

BACTERIAL WATER QUALITY

Bacterial Count	Minimum	Maximum	Geometric Mean
Total Coliform (MPN/100 ml)			
Station Number 1	185	370	311
Station Number 2	243	360	298
Fecal Coliform (MPN/100 ml)			
Station Number 1	88	351	110
Station Number 2	16	84	47
Fecal Streptococcus (MPN/100 ml)			
Station Number 1	120	1,150	302
Station Number 2	116	490	251

No large impoundments occur in the watershed but there are 36 farm ponds which have a total area of about 15 acres. There are no wetlands in the watershed (3).

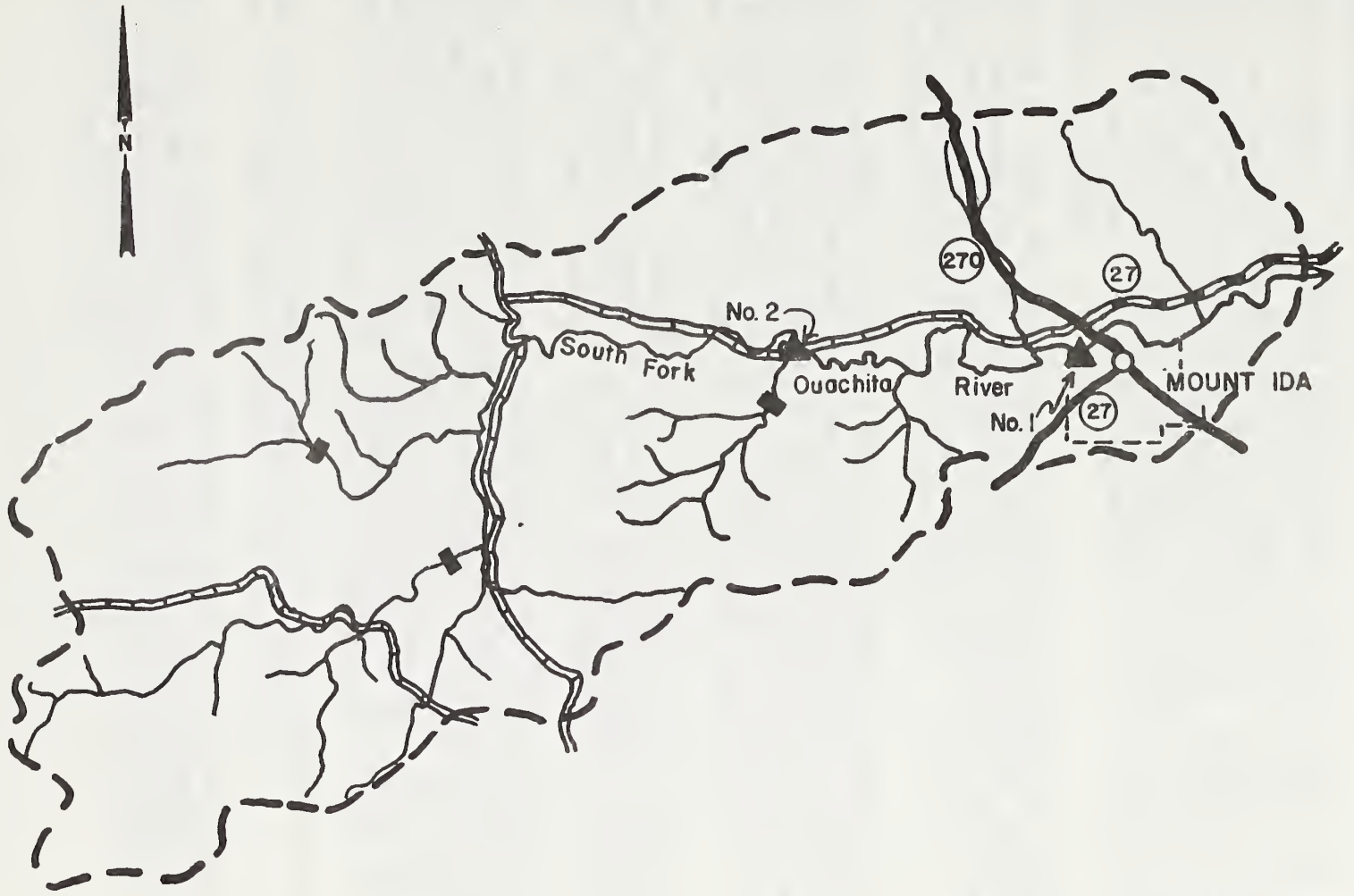
Present and Projected Population

The 1970 population for Montgomery County was 5,821 (7). Projected population for the county in the year 2000 is 8,326. Of the projected population, 3,780 will be urban and 4,546 will be rural.

The present population of the watershed is 1,383, of which 564 are rural and 819 are urban. Projected to the year 2000, rural population will be 690 and urban 2,015.

Projected populations are based on statistical data obtained from the United States Census of Population.

The major motivating factor in migration from the general area has been the lack of employment opportunities. Changes in the area's population are functions of changes in unemployment. Social conditions tend to improve as the resources of an area are developed and more employment opportunities become available. With industrial employment now increasing, population is expected to increase.



SOUTH FORK WATERSHED

Water Quality Sample Stations

Economic Resources

The major source of income is from the sale of timber, timber related products, livestock and livestock products. Open land in the watershed is devoted almost entirely to the support of livestock. The cleared upland portion of the watershed is used primarily for grazing, and most of the bottom land is in improved pasture and meadow. Average annual agricultural yields per acre in the flood plain consist of hay, 3.5 tons; pasture, 9 animal unit months; and soybeans, 37 bushels. Average annual yields in the upland areas of the watershed are hay, 2 tons; and pasture, 5 animal unit months.

From 1964 to 1969, the average value of land and buildings in Montgomery County increased from $14,751 to $30,208 per farm unit (6). The flood plain land is valued at about $300 per acre. The value of the upland varies according to the location and intended use. The upland suitable for agricultural use is valued at about $200.

From 1964 to 1969, the number of farms in Montgomery County decreased from 666 to 424, while the average size increased from 154 to 157 acres. In 1969, 152 farms, or 36 percent of the farms in Montgomery County, had sales under $1,000. Farms with sales under $2,000 were 52 percent of the total. Of the total number of farms in the county, 329 were fully owner-operated, 78 were part-owner operated, and 17 were tenant-operated (6).

With the increase in unemployment, brought about by the decline in the number of farms, an exodus of the rural population began. Because there were no large urban areas in the county offering industrial employment, this surplus labor force was forced to seek employment outside the county.

This trend of outmigration continued until about 1960 when Montgomery County reached a low of 5,370 inhabitants. To help reverse this trend of outmigration, the residents of Mount Ida and Montgomery County began seeking new sources of employment. By 1968, a total of five industries were located in the county, including a garment factory and a shoe factory at Mount Ida. Total industrial employment now numbers about 450 and total population for the county increased to 5,821 in 1970 (7).

There are 85 farms in the watershed with an average size of 175 acres. About 25 of these farms are located in the flood plain.

Mount Ida, the county seat of Montgomery County, is the principal trade center for the watershed. Services available in Mount Ida are as follows: (1) health facilities (county hospital), (2) news media (weekly newspaper), (3) transportation facilities, (4) educational facilities (grade and high schools), and (5) churches.

The transportation needs are served by a system of state highways, county roads, and Forest Service roads which provide access to all parts of the watershed. The paved highways consist of U. S. Highway Number 270 and Arkansas State Highway Number 27.

Despite the increase in nonagricultural employment, per capita income for this area remains far below the State average. In 1970, the per capita income was $1,784 compared to the State average of $2,649. The unemployment rate for the Mount Ida work area was 6.9 percent (1).

The watershed is located in an area that is economically depressed, as evidenced by the fact that the entire county has been designated eligible to receive assistance under Titles IV and V of the Public Works and Economic Development Act of 1965. The watershed is located in the West Central Arkansas Planning and Development District (established under Title IV of the Public Works and Economic Development Act) and is within the Ozarks Economic Development Region (Title V).

The West Central Arkansas Planning and Development District includes ten counties and was established in order that economic development projects of broad geographical significance might be planned and carried out. The primary purpose of this district is to improve the economic and social conditions within this depressed area.

The Ozarks Economic Development region has many of the same goals as the Planning and Development District but covers a much larger area (multi-state).

Plant and Animal Resources

Trees are the dominant plant resource in the watershed. The higher elevations on the north slopes support an oak-hickory association. The predominant trees on the lower north slopes and south slopes are shortleaf pine and pine-hardwood mixture. The common trees on the small scattered forest tracts in the bottom land are white oak, red oak, sweetgum, elm, and blackgum. The estimated average timber resource is as follows:

Pine sawtimber	3,000 board feet per acre
Hardwood sawtimber	500 board feet per acre
Pine pulpwood	2 cords per acre
Hardwood pulpwood	1.2 cords per acre

There are five forest wildlife habitat types within the watershed; (1) white oak-red oak-black oak, (2) post oak-blackjack oak-black hickory, (3) eastern redcedar, (4) silver maple-river birch-elm, and (5) shortleaf pine-oak-hickory. The most prevalent forest type is shortleaf pine-oak-hickory. The silver maple-river birch-elm type is generally restricted to streambanks. The eastern redcedar (cedar glade) type is localized where underlying shale or limestone has been exposed. The post oak-blackjack oak-black hickory type is found on the southerly exposed, drier sites. The white oak-red oak-black oak type is found on moist, protected sites.

The major agricultural plant resources are 1,818 acres of native pasture and 1,225 acres of improved pasture (fescue and bermudagrass). Some of the pastureland is used for hay production during the first part of the growing season and is then grazed during the late summer and fall.

Beef cattle production is the major farm enterprise in the watershed. Most are cow-calf operations. There are 58 head of cattle permitted on national forest land. The number of cattle in the watershed is below the estimated carrying capacity.

The watershed's land use pattern strongly favors forest wildlife species. There are approximately 41,000 acres of pine-hardwoods on Land Capability Classes IV through VII. Estimated fall-game populations on these forest lands are one deer per 175 acres, one turkey per 125 acres, and one squirrel per 10 acres.

Openland wildlife habitat is found along the wider flood plains, stream terraces, and upland benches. Estimated fall-game populations are one cottontail per 5 acres and one bobwhite per 150 acres. Rabbit, quail, and dove hunting may be excellent at specific locations; but, as the density figures indicate, the watershed's openland wildlife population is poor.

Wetland wildlife habitat is found along streams and farm ponds. Except for occasional migratory waterfowl, wood duck is the only significant waterfowl species. Woodcock are common along upland wooded flood plains, while Wilson's snipe are occasionally found in wet pastures.

Examples of resident non-game birds principally found are warblers (8 species), vireos (3 species), thrushes (2 species), wrens (3 species), nuthatches (3 species), owls (3 species), hawks (3 species), and woodpeckers (7 species). The red-cockaded woodpecker should be reported as a possible resident of the watershed. It is found in open pine stands, but usually is found in the pine woodlands of the Gulf Coastal Plain to the south of this watershed.

Examples of nongame mammals are short-tailed shrew, prairie mole, big brown bat, armadillo, eastern chipmunk, flying squirrel, wood mouse, and striped skunk. Populations of whitetail deer and squirrel are presently "moderate" or "low" relative to the watershed's potential. Black bear inhabit the large, relatively undisturbed acreages of the watershed.

A population of wild canids with some individuals having red wolf characteristics has been reported from the watershed vicinity. Red wolves may also be in the watershed.

A recent publication by the Arkansas Game and Fish Commission listed the major smallmouth bass streams of Arkansas. A reach of the Ouachita River immediately north of this watershed and a reach of the Caddo River immediately south of this watershed were among the streams listed. South Fork Ouachita River is also a smallmouth bass stream, but not of the same reputation.

Fish population samples conducted by the Arkansas Game and Fish Commission indicate standing crops of approximately 250 pounds per acre of stream pool in South Fork Ouachita River. In addition to smallmouth bass, the catchable sport fish population included longear sunfish, channel catfish, spotted bass, green sunfish, largemouth bass, black crappie, bluegill sunfish, and rock bass. Sample results from headwater reaches were more variable, 150 to 300 pounds per acre of stream pool. Most of the same sport species were present; however, the sunfishes comprise a larger percent of the standing crops.

The stream reaches which will be inundated by project structures are headwater in nature. Examples of riffle fish species inhabiting these waters are banded darter, orangebelly darter, greenside darter, and slim minnow. Species that inhabit the interface between riffles and pools are channel darter, stoneroller, and bigeye shiner. Species inhabiting the clear, shallow pools of this habitat type include redfin shiner, creek chub, creek chubsucker, freckled madtom, and brook silverside.

Three rare fish species have been collected from watersheds adjacent to the South Fork Watershed. These species are the paleback darter (Etheostoma pallididorsum), Kiamichi shiner (Notropis ortenburgeri), and the colorless shiner (Notropis perpallidus). Although none of these species are known to have been collected within the South Fork Watershed, the proximity of the collections to this watershed and the habitat preferences of these species indicate that any of them could possibly exist in this watershed.

The following information on these species was obtained from the Arkansas Natural Area Plan (16).

The paleback darter prefers clear, shallow, backwater pools or spring areas with mud-gravel bottoms, often covered with dead leaves or other organic matter. It is also found occasionally on shallow riffles with loose gravel bottoms and patches of detritus. It occurs mainly in the extreme headwaters of the Caddo River in Montgomery County and has also been located in a headwater creek of the Ouachita River.

The Kiamichi shiner is found primarily in clear streams with permanent flow and gravel bottoms. Earlier collections of this species were from nine localities in the Ouachita Mountains of southwestern Arkansas. Recent collections have been made from tributaries of the Fourche La Fave River and Ouachita River.

The colorless shiner inhabits small to moderate-sized warmwater rivers with a variety of bottom types in slow or quiet water. The largest collections of this species have been from clear, gravel-bottomed streams of the Ouachita River system. Its known range in Arkansas is the eastern Saline River, Ouachita River, Caddo River, and Little Missouri River.

An evaluation of the stream fish habitat downstream from the proposed structures has been conducted. Physical parameters, such as pool to riffle ratio,

average pool area, average pool depth, bottom type, and stream shelter were evaluated. Based upon this survey, affected stream reaches were rated regarding quality of habitat. The stream reach downstream from Structure Number 2 received the highest rating, followed by the stream reach downstream from Structure Number 3. The stream reach downstream from Structure Number 1 received the lowest rating.

Recreational Resources

The only developed recreational area in the watershed is the Mount Ida School playground. Other recreational activities are fishing, swimming, horseback riding, hiking, nature walking, birdwatching, wildlife photographing, picnicking, camping, sightseeing, pleasure driving, game hunting, and mineral collecting. Recreational facilities have been developed on Lake Ouachita, which is located near Mount Ida. Within a distance of 14 road miles from Mount Ida there are seven recreation sites along the Lake Ouachita shoreline. Five of these are Corps of Engineers' facilities, one is a Ouachita National Forest facility, and one is a privately owned camp. All of the facilities, except the privately owned camp, are open to the general public.

Float fishermen use the section of South Fork Ouachita River from U. S. Highway 270 to the watershed outlet. The section from U. S. Highway 270 up to the point where the stream turns south is mainly used by wade fishermen.

Archeological and Historical Resources

No areas within Montgomery County are listed in, pending inclusion in, or currently under consideration for nomination to the National Register of Historical Places. According to the Arkansas Archeological Survey, there are no known archeological resources in the areas surveyed for structural measures.

Soil, Water, and Plant Management Status

Landowners in the watershed are provided technical assistance by the Arkansas Forestry Commission in cooperation with the U. S. Forest Service, and by the Soil Conservation Service field office at Mount Ida. The Ouachita National Forest land is managed by the U. S. Forest Service to fulfill wildlife recreation, timber, and other environmental requirements. About 57 landowners in the watershed presently cooperate with the Montgomery County Conservation District. Conservation plans that cover 52 percent of the privately owned land have been developed for these cooperators and about 65 percent of the planned conservation land treatment measures have been applied. (Table 1A).

In past years, a large part of the flood plain of the South Fork Watershed was intensively farmed. As damages from flooding increased and markets grew more competitive, farmers were forced to convert to grassland-type operations. With adequate flood protection, intensive use of the flood plain is anticipated.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land and Water Management

Proper land treatment practices such as conservation cropping systems, proper crop residue management, minimum tillage, and on-farm drainage cannot be practiced on the areas of the flood plain that are frequently flooded, nor can these areas be used to their greatest capability. Much of the flood plain is in pasture and hayland that could be used for cropland if flooding were controlled.

The management of grassland needs to be improved to reduce erosion and runoff. Practices needed include renovation and seeding additional grasses and legumes, brush management, weed control, fertilizing and liming, and proper grazing use.

The major part of the drainage area above the proposed structures is federal land administered by the Forest Service. Areas that need conservation land treatment measures include 13 acres of gullies, 1 acre of streambank, 1 acre of stream channel, 20 miles of system or functional roads, 17 miles of abandoned roads and trails, and 2 acres of critical sheet erosion.

Stand improvement measures are needed on about 1,200 acres of privately owned forest land. Most of this is in small farm holdings that have been neglected and not managed for timber production. Less than ten percent of the forest area has light to moderate damage from grazing. Efforts to bring the privately owned forest land under proper forest management will require concentrated planning. The examples of good national forest and industrial management, together with the relative ease of applying the needed land treatment measures, should make motivation easier.

Floodwater Damage

About 1,606 acres of bottom land in the watershed are subject to floodwater damages by a 100-year frequency flood.

To analyze flood damages, the flood plain was divided into two evaluation reaches. These reaches were selected after considering the width of the flood plain, land use, and frequency of flooding. The location, total flood plain, and average annual area flooded by reaches are as follows:

Reach	Location	Total Flood Plain (acres)	Average Annual Area Flooded (acres)
I	Watershed Outlet to Arkansas Highway 379 Bridge	1,002	750
II	Arkansas Highway 379 Bridge to Structures Numbers 2 and 3	604	684
Total		1,606	1,434

This table reveals that the average annual area flooded in Reach II is greater than the total flood plain in that reach. This indicates that flooding occurs several times each year. The average annual area flooded is the cumulative acres flooded by each flood in a 100-year period divided by 100.

Minor flooding is experienced an average of three times annually in Reach II. A major flood, or a flood that inundates at least one-half of the total flood plain, can be expected annually.

Because of the frequency of flooding and the physical characteristics of Reach II, land use in the agricultural flood plain has been restricted. Projected land use (without project) on the 604-acre flood plain in Reach II is grassland, 574 acres and other land 30 acres. Average annual floodwater damages for Reach II are estimated to be $22,280 and include crop and pasture, other agricultural, and nonagricultural.

In Reach I, minor flooding can be expected an average of twice annually with a major flood once every seven years. Because of the less frequent flooding and the physical characteristics of the flood plain in Reach I, a more intensive use of the flood plain for agricultural production can be realized. The projected land use (without project) of the 1,002 acres of the flood plain is cropland, 301 acres; grassland 651 acres; and other land, 50 acres. Average annual floodwater damages for Reach I are estimated to be $40,710. Average annual floodwater damages for Reach I include crop and pasture, other agricultural, and nonagricultural.

The City of Mount Ida is located in Reach I on the south bank of South Fork Ouachita River. Most of the city is above the flood plain and is not affected by flood flows. The city limits of Mount Ida extend only to the edge of the river. About 41 acres within the incorporated area are subject to flooding from a 100-year frequency flood and 11 properties are subject to damage. Damages result from first floor flooding to commercial, industrial, and residential properties.

An additional 112 acres are subject to flooding in the remainder of the flood plain on the north side of the river adjacent to Mount Ida. Some development is occurring in this flood plain and six properties are subject to damage. The areas subject to flooding are shown on Figure 2B, Urban Flood Plain Map, Mount Ida, Arkansas.

Indirect damages result from threatened or actual flooding and include interruption of travel; loss of income by workers who commute or are unable to work in the fields; loss or delay in sales by local merchants; and additional time, distance, costs and general inconvenience associated with marketing of farm products, delivering mail, and transporting children to school. Indirect damages of $14,510 are about 15 percent of the direct damages.

Average annual floodwater damages for the entire flood plain are estimated to be $68,450. These include crop and pasture, $30,840; other agricultural, $7,300; and nonagricultural, $30,310.

Damages from the May 1968 flood, a 50-year event, caused an estimated $131,815 in damages. Damages in Reach I were estimated as follows: urban, $70,415; crop and pasture, $22,000; and other agricultural (fence damage $5,200). Eleven residential properties, three industrial properties, and three commercial properties were damaged in the urban area. Damages in Reach II from the May 1968 flood were estimated as follows: road and bridge, $19,500; crop and pasture, $8,000; and other agricultural, $6,700.

Erosion Damage

Erosion rates are generally low throughout the watershed. The average annual gross erosion rate is 2.64 tons per acre. The annual sheet erosion rate is 1.55 tons per acre. Roadside erosion constitutes about 40 percent of the gross erosion. Streambank erosion and gully erosion are not major problems in the watershed.

About 425 acres in Reach I and 229 acres in Reach II are damaged by scour erosion. Of the total, 196 acres are damaged 10 percent, 163 acres are damaged 20 percent, 201 acres are damaged 30 percent, 69 acres are damaged 40 percent, and 25 acres are damaged 50 percent. The damages occur on agricultural land and are equal to an annual loss of $12,160 of agricultural production.

Sediment Damage

Sedimentation by overbank flooding damages 330 acres of the flood plain. Most of the damage occurs as localized deposits of relatively infertile coarse grain materials. About 251 acres in Reach I and 79 acres in Reach II are damaged by sediment. Of the areas involved, 193 acres are damaged 10 percent, 120 acres are damaged 20 percent, 14 acres are damaged 30 percent, and 3 acres are damaged 40 percent. The damages occur on agricultural land and are equal to an annual loss of $3,850 of agricultural production.

The average annual sediment yield at the mouth of the watershed is about 35,500 tons. Although sediment is not a major problem at the watershed outlet, sediment pollution in Lake Ouachita is increased by sediment from South Fork Watershed. The average annual sediment concentration at the watershed outlet is about 188 milligrams per liter.

Drainage Problems

About 500 acres of the soils in the watershed are classified as poorly drained. Drainage of these wet soils may be accomplished by onfarm drainage systems.

Municipal and Industrial Water Problems

The City of Mount Ida has obtained its water from the South Fork Ouachita River for several years. The demand for water has been at a rate of up to 200,000 gallons per day and the river has never ceased to supply this amount of water. Although the river has been able to supply this demand, it has become very low and almost stopped flowing during dry periods. The 7-day, 2-year low flow record from 1949 to 1960 at Mount Ida is 0.047 cubic feet per second per square mile which is equivalent to 1.9 million gallons per day.

The 7-day, 5-year low flow is 206,720 gallons per day, i.e. one year in 5 or a 20 percent chance water will be scarce. No flow is indicated for the 7-day, 10-year low flow record (15).

The area in and around Mount Ida is expected to grow and expand in the near future, especially east of the city. At the present time, a Rural Water Users Association is planning to install a water distribution system to serve about 200 families.

As projected by the city's engineering consultant, the expected population equivalent to be served by the year 2020 is 7,275 persons, with a demand rate (peak daily usage including commercial and industrial) of 275 gallons per capita per day. With this demand, the South Fork Ouachita River will not be able to provide enough water for Mount Ida during a dry season.

Plant and Animal Problems

The low flows that occur in South Fork Ouachita River during dry periods limit the value of this stream as a smallmouth bass fishery.

Fishing opportunities in the watershed are insufficient to satisfy demand. However, Corps of Engineers' reservoirs and numerous rivers in the vicinity easily satisfy residents' fishing demand.

Very little waterfowl hunting is provided within the watershed. Farm game hunting is good locally, but the amount and distribution of farm game habitat is very poor. Whitetail deer hunting is poor, as indicated by legal deer harvests from Montgomery County for the past two years.

Where timber management favors mature stands of pine rather than mature mixed stands, the diversity of non-game wildlife populations is decreasing. Regeneration is needed annually in the extensive, densely forested national forest land for timber management and wildlife habitat diversity. This diversity also decreases when native pastures are changed to improved pastures.

Water Quality Problems

There are no major water quality problems in the South Fork Watershed. Water quality data is limited with information available from only one regular sampling point. The sampling point is located at a bridge on U. S. Highway 270 at Mount Ida and the period of record is from August 1969 to June 1972. The lowest percent saturation of dissolved oxygen during the sampling period was 76 percent with an average of 91 percent. The watershed is 91 percent woodland and the land use is not expected to change appreciably in the future. Very small quantities of fertilizers and pesticides are used in the watershed; therefore, they are not expected to cause a water quality problem. Mount Ida's sewage lagoon effluent empties into South Fork Ouachita River about one-half mile downstream from the bridge on U. S. Highway 270 at Mount Ida. This sewage effluent is the only source of pollution that might cause a water quality problem in the watershed.

Economic and Social

In 1969, 152 farms or 36 percent of the farms in Montgomery County, had sales under $1,000. Farms with sales under $2,000 were 52 percent of the total (6).

The watershed is in an area which has been declared eligible for aid under the Public Works and Economic Development Act of 1965.

Additional employment opportunities are needed. The unemployment rate is 6.9 percent and the per capita income is $1,784 for Montgomery County (1). This low income reduces the individual purchasing power and the tax base. Rural community development is needed in the watershed.

PROJECTS OF OTHER AGENCIES

South Fork Watershed outlets into the flood pool of Lake Ouachita. This lake was formed by the construction of Blakely Mountain Dam on the Ouachita River about 10 miles northwest of Hot Springs, Arkansas. This project was constructed by the Corps of Engineers for flood control and power generation. Recreational facilities have been developed at many locations on the lake, including several areas near Mount Ida (5).

South Fork Watershed will provide flood protection to agricultural areas above the elevation of the flood pool of Lake Ouachita. The operation of Lake Ouachita will not affect the floodwater retarding structures included in the South Fork Watershed Work Plan.

PROJECT FORMULATION

The sponsors of the watershed project recognized the need for a comprehensive approach to the watershed problems. They made an application to the Arkansas Soil and Water Conservation Commission on February 25, 1965, for assistance under the provisions of Public Law 566. The application was amended on October 2, 1965, to include Williams Creek (15,000 acres), as a part of the South Fork Watershed.

A preliminary investigation report was prepared by the Arkansas Soil and Water Conservation Commission September 3, 1965. The State set the planning priority for upland watersheds as Number 3 for South Fork Watershed and a request for planning authorization was made on October 16, 1969. Planning authorization was obtained February 16, 1970. On July 25, 1968, the Montgomery County Conservation District Board adopted a resolution for a plan of improvements for the proposed improvement project area. A public hearing was held on September 13, 1968, regarding the creation of the South Fork Improvement Project Area. On September 4, 1969, the Mount Ida City Council passed a resolution asking the assistance of the Montgomery County Conservation District.

In March 1974, in a letter submitted to the Secretary of Agriculture by the sponsoring organizations, it was requested that the Williams Creek drainage area be withdrawn from the South Fork Watershed. This reduced the watershed area to 44,851 acres which is the same as the acreage in the original application.

An agreement between the Montgomery County Rural Water Users Association and the City of Mount Ida was signed on April 30, 1973. Under this agreement, the City of Mount Ida will furnish the Association three million gallons of water per month.

Preliminary cost estimates were furnished to the City of Mount Ida for a municipal and industrial water supply in Structure Number 1. The City of Mount Ida will receive financial assistance from the Arkansas Soil and Water Conservation Commission to carry out their responsibility in developing the municipal and industrial water supply.

Additional information during planning was obtained from the Corps of Engineers, Vicksburg District, and the U. S. Geological Survey, Little Rock District.

The Bureau of Sports Fisheries and Wildlife, U. S. Department of Interior, submitted a report on the watershed November 4, 1970, with recommendations to minimize losses to downstream aquatic habitat. The Arkansas Game and Fish Commission concurred in these recommendations in a letter dated September 14, 1970. The recommendations included the following:

1. Provide a cool-water bypass and low-flow port in each floodwater retarding structure, and Multi-Purpose Structure Number 1 which may require multi-level gated ports.

2. Equip outlet structures with drawdown gates capable of exposing about 50 percent of sediment pool bottom.

The South Fork Watershed is located in the Ouachita River Basin. A Type IV Comprehensive Multi-Purpose Plan is currently being developed for this basin. The South Fork Watershed will be included in the basin plan as a feasible project that will help meet projected needs for this area within the next 10 to 15 years.

Objectives

After consideration of the needs of the watershed and the physical capabilities of the area, the following objectives were agreed upon by the sponsoring local organizations and the Soil Conservation Service:

1. To install needed land treatment measures which will:

   a. Increase the efficiency of land use and obtain maximum benefits from the proposed improvements.

   b. Reduce the sheet erosion in the watershed to an average of less than 1.3 tons per acre per year.

2. To provide an acceptable level of protection from flooding at the lowest cost, considering installation, operation, maintenance, and replacement.

3. To install a multiple purpose structure that will provide a municipal and industrial water supply to meet present and future demands for the City of Mount Ida and surrounding rural areas.

4. To install structural measures and land treatment measures that will produce maximum feasible protection to fish and wildlife resources.

5. To provide the highest level of protection to the urban area that is economically feasible.

6. To make the watershed an outstanding example of soil and water conservation.

An analysis of the land treatment data in the conservation district records indicated that the land treatment goals which had been agreed upon were realistic and could be accomplished during the 5-year project installation period if additional technical assistance was provided.

The consulting engineer for the City of Mount Ida reported that the present population served by the water system is about 819, with a demand rate (peak daily usage including commercial and industrial) of 244 gallons per capita per day. The consultant also projected a future population equivalent of 7,275 to be served by the year 2020, with a demand rate of 275 gallons per capita per day. Based upon a reservoir operation study, Multiple Purpose Structure Number 1 would supply two million gallons per day during a drought period equivalent to the drought of record. These records were from 1949 to 1970.

Environmental Considerations

Consideration was given to each potential environmental impact of the project and procedures and features were included in the plan to minimize the adverse impacts. These included impacts to areas of natural beauty; quality of water, land, and air resources; biological resources; commitment of resources; and archeological resources.

Natural beauty in the national forest land will be enhanced by the treatment of areas having critical land stabilization problems. Fire protection will maintain the natural beauty of the forested areas. Land treatment practices will improve the appearance of farms in the watershed.

Borrow areas were located so as not to detract from the natural beauty surrounding the structures. Borrow pits will be made self-draining to prevent vector problems. Disturbed areas will be vegetated as soon as possible after construction. Low-flow releases from the reservoirs will provide perennial flow to the streams to enhance their beauty. The adequate water supply can improve the appearance of lawns and shrubs in the Mount Ida area.

Multiple Purpose Structure Number 1 will not be used for recreation or other purposes in a manner whereby the water supply might become contaminated and thus become a potential hazard to public health. Sponsors will not provide public access to Floodwater Retarding Structures Numbers 2 and 3. Most of the sediment originating above the structures will be trapped which will improve water quality downstream from the structures including Lake Ouachita. The accelerated establishment of conservation land treatment measures will help maintain and improve the soil resources of the watershed. Reduced flooding will lessen environmental damages in the urban and rural flood plain. Measures will be used during construction to minimize water and air pollution. The minimum number of structures necessary to provide for acceptable level of protection were included in this project in order to have the least possible adverse impact on the environment while meeting the flood control objectives of the sponsors.

Aquatic habitat downstream from the structures will be improved because of the reduction of sediment and the creation of perennial flow. About 200 acres of lake fish habitat and waterfowl habitat will be created. Revegetation of embankments, spillways, and borrow areas will include plants desirable for the reestablishment of wildlife habitat and erosion control. The Forest Service's plan includes clear cutting small areas in the watershed to create and maintain diversity of wildlife habitat. The pool peripheries will be planted with vegetation that is beneficial for waterfowl food.

The National Register of Historic Places has been reviewed and no sites listed will be affected by this project. The Arkansas Archeological Survey has surveyed the proposed site locations and no archeological values were identified.

Clearing for construction will be limited to that required for embankments, spillways, borrow areas, and pools to minimize committed resources. Timber resources on the areas to be cleared will be harvested. The structures were located so as not to displace any person, business, or farm operations. Every reasonable effort will be made to prevent damaging archeological or historical values in the construction areas.

Alternatives

The following are alternatives to the recommended plan for the use of available resources.

(1) Accelerated conservation land treatment measures only.

This alternative consists of accelerating the present program of land treatment for watershed protection. The land treatment measures to be applied would be the same as those described in the land treatment section of the recommended plan. However, the acreages would be different because there would be no restoration of land to its former productivity without flood control. This would mean fewer acres of cropland and more grassland to be treated. The forestry measures would be practically the same as described in the recommended plan.

The installation of the land treatment measures would reduce erosion about 18 percent and floodwater damages about 5 percent. Surface water runoff would be reduced by increasing rainfall infiltration. The environmental effects of the land and forestry treatment measures are discussed in the Effects of Works of Improvement section. This alternative would have an estimated cost of $125,900. Approximately 95 percent of the benefits would be foregone if this alternative were implemented.

(2) Accelerated conservation land treatment, securing municipal and industrial water from Lake Ouachita, and leveeing the urban flood plain.

The land treatment measures to be applied would be the same as those described in the land treatment section of the recommend plan.

Although Lake Ouachita was not constructed as a source of municipal water supply, the Office of Chief of Engineers, Corps of Engineers, has the authority under the Water Supply Act of 1958 to supply water to small municipalities.

The installation of the alternative would involve attainment of about a 50-foot wide easement from the lake to the treatment plant; construction of a pumping plant with two pumps near the lake; laying 5.5 miles of 16-inch high pressure water line; purchase of about 12 acres of land for the levee and borrow area; relocation of 4 residential houses; construction of a three-fourths mile levee with an average height of 10 feet; and the installation of a pumping plant to remove water from inside the levee.

Implementation of this alternative would provide all the water needed for future growth in the Mount Ida area. About 41 acres of urban flood plain would be protected from flooding by South Fork Ouachita River. Construction would cause a temporary increase in sedimentation until the areas were revegetated. About 41 acres protected by the levee could be developed for urban use.

The levee would protect 5 residential properties, 1 industrial property, and 1 commercial property. Four residential properties would have to be relocated to build the levee.

About 34 acres of the urban flood plain is undeveloped. The total construction costs are estimated to be $616,000, of which the levee and pump would be $185,000; the water line, $406,000; and the pumping plant, $25,000. The annual pumping costs would be about $6,000. About 46 percent of the annual benefits would be foregone should this alternative be implemented.

(3) Accelerated conservation land treatment, securing municipal and industrial water from ground water sources, and changing land use of the urban flood plain.

The land treatment measures to be applied would be the same as those described in the land treatment section of the recommended plan.

The average ground water yield from 3 inch diameter wells in the watershed is about 10 gallons per minute. To meet the future demand rate of two million gallons per day would require 140 wells. The wells should not be located within 1,000 feet of each other in an east-west direction. The wells would average about 350 feet deep. About 85,000 feet of collection water line would be required to deliver the water to the treatment plant.

The wells would be cased in the top 100 feet. A small pump would be installed in each well. The wells could be installed at a rate that would satisfy the growing demands for water in the area. The present water supply would continue to be used whenever water was available in the river because pumping costs would be less expensive.

The estimated installation cost of the well system, excluding pump houses, land rights, and power lines to the pump, is $712,000.

Damages could be reduced in the urban flood plain by changing the land use to one that has little or no damageable value such as a park, playground, or ball field. This would require relocating a lumber yard and sawmill, a sale barn, a warehouse, an office building, and seven residential properties. The estimated value of these properties is $200,000. Relocation costs were not estimated.

Only small areas of the environment would be disturbed by well installations at any one time because the complete installation would take place over a 40 or 50 year period. The collection water lines would be small in diameter so their installation would not alter the environment significantly at any location. About 15 acres would be required for pump locations and water lines.

Land use changes in the developed urban flood plain would require about 10 acres of development outside the flood plain and could make this area of the flood plain available for recreational activities that do not require damageable values for development. About 73 percent of the annual benefits would be foregone should this alternative be implemented.

(4) No project action.

With no project action, flood damages will continue to occur. Land treatment measures will continue to be installed at about the present rate. Wildlife habitat will remain in its present state or change at a normal rate for improvement or deterioration in quality for individual species. The fishery resource will probably remain in its present state. No land will be required for construction purposes and no production will be lost in construction sites. The net annual monetary benefits that will be foregone by not implementing the project will be $32,410.

Critical area stabilization and forestry management practices on the national forest land will be included in the Forest Service's long-range plan for the Ouachita National Forest.

Growth and development of the Mount Ida area will be restricted by the present water supply and the rationing of water is imminent during dry periods even with a slight increase in growth. The city

would be unable to assume full financial responsibility for a single-purpose municipal and industrial water supply reservoir.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

An effective conservation program is an integral and essential part of a sound program for watershed protection and flood prevention. Such a program is currently being conducted by the Montgomery County Conservation District by providing assistance to each district cooperator in the development and application of conservation plans with technical assistance provided by the Soil Conservation Service. Each plan and the overall program are based on the use of each acre of land within its capabilities and treatment in accordance with its needs for protection and improvement in the chosen use. Any conservation land treatment resulting from the technical assistance is voluntary action taken by individual farmers and operators.

The accelerated application and continued maintenance of land treatment measures is important for the protection of land above the proposed structures. These measures will produce onsite benefits, reduce the capacity that must be provided in the structure for sediment accumulation, and reduce runoff. Runoff from the uncontrolled area which contributes to floodwater damages will be reduced by land treatment measures. Land treatment will be accelerated throughout the watershed. Table 1 includes estimates of the acreage that will be adequately treated during the 5-year project installation period. These measures will be established and maintained by the landowners and operators in the watershed.

Proper land treatment measures will be applied on 400 acres of cropland to promote good land management. This includes conservation cropping systems, proper crop residue management, and minimum tillage. Field ditches will be needed to drain wet areas.

Five hundred acres of pastureland will be improved by proper management including brush management, weed control, fertilizing and liming, proper grazing use, renovation, and seeding additional grasses and legumes. About 1,400 acres of native pastures will be improved by proper grazing use, brush management, and weed control. Also, grazing will be improved on 600 acres of woodland by proper grazing use. Grazing distribution will be improved on grassland by the construction of 12 additional ponds.

The areas planned for accelerated land treatment on national forest lands are 13 acres of gullies, 1 acre of streambank, 1 acre of stream channel, 20 miles of system or functional roads, 17 miles of abandoned roads and trails, and 2 acres of sheet erosion, to be protected by vegetative cover. The land treatment measures include road bank and streambank stabilization, road drainage and diversions, and vegetation. About five tracts of 50 acres each will be regenerated each year in the national forest land.

Accelerated technical assistance to private landowners in the watershed, provided by the Arkansas Forestry Commission cooperating with the U. S. Forest Service, will result in effective forestry practices applied to forest land. In harmony with sound watershed management, forest lands will be managed to fulfill wildlife, recreation, timber, and other environmental requirements. Forest management efforts will be directed to attain the most desirable forest succession type to meet desired multiple use goals.

The accelerated land treatment measures planned for the private forest are stand improvement measures on 1,200 acres. These are silvicultural measures designed to improve the forest's hydrologic capabilities by creating a stand composition that will produce optimal development and protection of forest cover, litter, and humus. These practices include improvement cuttings, tree release, and cull removal. Accelerated forest land treatment practices will not be performed unless the tract is protected from harmful grazing. Installation of the land treatment measures, accelerated management on private forest lands, and the continued level of management and protection of national forest and industrial lands will improve the forest hydrologic conditions from fair to good.

Structural Measures

Two single-purpose floodwater retarding structures and one multiple-purpose structure (flood prevention and municipal and industrial water supply) will be installed. The total installation cost is estimated at $1,825,700.

The structures will control floodwaters from 26.44 square miles, or about 38 percent of the total watershed. The structures are designed to provide temporary storage of runoff and then release the water at a rate that will reduce downstream flooding. Floodwater will be released through ungated, self-operating, reinforced concrete conduit principal spillways constructed on nonyielding foundations. The principal spillways will have single-stage inlets and will include a drain valve to facilitate the installation of the dam by disposal of runoff during construction and to drain the impoundment, as needed, for repairs. Mid-level gates will be installed in Structures Numbers 2 and 3 to be used as fisheries and waterfowl management tools by making it possible to expose as much as one-half of the bottom area of the sediment pools. This will allow the exposure of shallow edges for waterfowl plantings and manipulation of water levels for aquatic weed control and fish management operation. A plunge basin will be installed at the outlet of the principal spillways to reduce the energy of the water before it enters the downstream channel.

The structures will be earthfill with rock emergency spillways which will pass flows in excess of detention storage and conduit release. These spillways will have a two percent chance of operation or will be expected to function on a 50-year frequency. Figure 1 shows a section of a typical multiple purpose structure. Plans for a typical structure are illustrated by Figures 2 and 2A.

The three structures will have a total storage capacity of 11,314 acre-feet. This will include 8,354 acre-feet for floodwater detention, 1,428 acre-feet for sediment accumulation, 1,352 acre-feet for municipal and industrial water supply, and 180 acre-feet for low-flow augmentation.

Storage will be provided in the structures for the sediment that will accumulate during the life of the project (100 years). The total sediment storage in the three structures will be 1,244 acre-feet for submerged sediment. An additional 184 acre-feet of aerated sediment is expected to accumulate in the flood pools. The sediment pools will initially fill with water but will gradually fill with sediment during the life of the project.

Multiple Purpose Structure Number 1 will provide 1,352 acre-feet of storage for a municipal and industrial water supply for the City of Mount Ida. Of this total storage, 338 acre-feet will be for immediate use and 1,014 acre-feet will be deferred for future use. The municipal and industrial water supply pool will have a surface area of 87 acres.

Runoff from the drainage area above Structure Number 1 will provide a firm yield of high quality water to meet the anticipated demand. A separate intake structure for the city's water supply will be installed. The intake structure will be constructed of reinforced concrete and will have three control valved openings (slide gates) at different elevations to permit the selection of water from various depths. An 18-inch raw water line will be located through the dam and will be constructed of reinforced concrete with cutoff collars. The water will flow by gravity in the South Fork Ouachita River for about 4 miles to the existing intake structure located near U. S. Highway 270 bridge on the west edge of the city. The water will be lifted out of the river at this point and pumped through a new 8-inch cast iron pipe raw water line to the new water treatment plant.

The water flowing down the river is not expected to become contaminated; however, a transmission line could be added later to transport the water from the impoundment to the treatment plant, if a pollution problem develops. A 300-foot buffer zone measured horizontally from the crest of the emergency spillway will be fenced to control access to the pool to comply with Arkansas State Department of Health regulations.

The principal spillways crest of Structure Number 2 will be set at the 100-year sediment elevation and will inundate 56 acres. An ungated port with an average release rate of 0.30 cubic feet per second will be placed at the 50-year submerged sediment elevation. This port will release water from a cool-water inlet located 10 feet below the principal spillway crest.

Structure Number 3 will provide for storage of 180 acre-feet of water to minimize adverse impacts to stream fisheries caused by Floodwater Retarding Structure Number 2. The storage is in addition to that provided for other purposes. This water will be released through an ungated port at the 100-year submerged sediment elevation with an average

release rate of 0.85 cubic feet per second. Water will be drawn through a cool-water inlet from a depth of 10 feet below the principal spillway crest. The low-flow augmentation pool at the principal spillway crest will inundate 50 acres.

The structures will store 8,354 acre-feet of floodwater between the crests of the principal spillways and the crests of the emergency spillways. The detention pools at the crests of the emergency spillways will have a total surface area of 541 acres. The 348 acres between the principal spillway crests and the emergency spillway crests will be subject to temporary inundation by floodwater. Floodwater detention capacities will range from 5.90 to 6.00 inches of runoff from the drainage areas above the structures.

The floodwater retarding structures do not provide complete urban protection from the 100-year frequency flood in Mount Ida. The structural measures provide the highest level of protection which is feasible. Nonstructural features such as flood proofing, or relocating the remaining buildings subject to flooding after project installation were considered, but would be prohibited because of the costs involved. The Mount Ida City Council will initiate an ordinance prior to the installation of structural measures to restrict development within the area still subject to flooding. This information will be published at least once annually. Improvements with a high damageable value will not be allowed to locate in the area subject to flooding from a 100-year storm. Improvements that will be considered by the City Council are parking lots, recreational areas, or educational nature trails. The City will consider development location, damageable values, flood proofing, and flooding depths before issuing development permits within the remaining flood hazard area.

The Montgomery County Conservation District, as a sponsoring local organization, will discourage further development in the remaining flood hazard area outside the city limits.

All three sites have potential for incidental recreation. However, the municipal and industrial water supply structure will not be used for recreation or other purposes in a manner whereby the water supply might become contaminated and thus become a potential hazard to public health. The sponsors will not provide public access to Floodwater Retarding Structures Numbers 2 and 3.

Suitable borrow material will be limited, and an additional 93 acres outside the pool areas will be needed. When possible, the borrow areas will be selected where a 200-foot band of vegetation can be left to screen these areas from public view. Haul roads from the borrow areas to the structure sites will be planned to prevent objectionable views of the borrow areas.

Present land use in the pools, embankments, emergency spillways, and offsite borrow areas are tabulated as follows:

Structure	Land Use: Grassland (acres)	Land Use: Forest Land (acres)	Total (acres)
Pools (at Crest of Principal Spillways)			
1	12	75	87
2	10	46	56
3	-	50	50
Subtotal	22	171	193
Embankments & Emergency Spillways			
1	-	7	7
2	-	7	7
3	-	9	9
Subtotal	-	23	23
Offsite Borrow Areas			
1	15	15	30
2	9	25	34
3	6	23	29
Subtotal	30	63	93
Total	52	257	309

Clearing during construction will be limited to areas required for embankments, spillways, borrow areas, and pools. Selective clearing will be utilized to preserve trees and shrubs useful for erosion control, wildlife habitat, screening objectionable views, and blending structural measures with the surroundings. Trees will be left standing in about 25 percent of the pool areas of Structures Numbers 2 and 3. Selected areas will be in the upper one-third of the pools and points where feeder streams enter. Stumps and logs will be piled to provide fish habitat after inundation.

Limits of areas to be cleared will be delineated well in advance of the construction to allow for the removal of timber. Trees or other cleared materials not salvaged and other wastes generated during construction will be disposed of in accordance with appropriate State and local regulations. Waste products will be burned or buried, depending on the nature of the material. Approved Forest Service criteria for land clearing, debris disposal, revegetation, and similar works on national forest land associated with the project will be followed. The revegetation plan and the fire protection plan will be approved by the Forest Service prior to construction.

The embankments and offsite borrow areas will be revegetated. Weeping lovegrass, sericea lespedeza, bahiagrass, white clover, fescue, and Korean lespedeza will be the principal plants used. When construction is complete, the periphery of the pools will be planted to Japanese or browntop millet. The areas in the flood pools subject to temporary inundation will remain in forest or grassland and can be used for grazing.

The installation of structural measures will require the modification of one mile of Forest Service roads and one-half mile of county roads. Two and one-half miles of Forest Service property lines will be reestablished and seven corners will be relocated with reference monuments.

During construction, all State and local health, safety, and air and water pollution regulations will be followed. The following actions will be taken to control erosion and pollution:

1. Sprinkling will be used to keep dust within acceptable limits.

2. Sanitary facilities will not be located over, or adjacent to, live streams or springs. The special provisions of construction contracts will require the contractor to comply with the manual, Safety and Health Regulations for Construction, published by the United States Department of the Interior, Bureau of Reclamation. In accordance with this manual a minimum of one of the following types of toilet facilities must be made available to each construction site depending on the number of people employed and site conditions and location:

    a. Privies
    b. Chemical toilets
    c. Recirculating toilets
    d. Combustion toilets

3. Measures such as diversions and water control structures will be provided at equipment storage and repair areas to divert runoff away from these areas and to prevent contaminants from reaching streams and ground water.

4. The following erosion and sediment control measures will be applied, as needed, to minimize stream turbidity at and downstream from the structures.

a. Diversions, waterways, and terraces will be used to retard the rate of runoff and control erosion from the construction site.

b. Debris basins will be used to minimize sediment resulting from construction and dewatering operations.

c. Clearing and grubbing of construction sites and borrow areas will occur in stages as construction progresses.

d. Temporary vegetation and/or mulching will be used to protect the soils. Segments of work will be completed and protected as rapidly as is consistent with construction schedules.

e. Conduits or bridges will be installed where construction activities cross flowing streams.

5. Prior to construction, areas will be designated for the disposal of waste material.

Vectors should not be a problem because of the remoteness of the structure sites. However, practices to prevent and reduce mosquito and other aquatic insect breeding sites include the following:

1. All borrow pits and other potential ponding areas associated with construction of the dam and relocation of roads that are located above the maximum pool level will be made self-draining.

2. Prior to impoundage, borrow pits and depressions that will be flooded by the reservoirs at maximum pool levels and would retain water at lower pool levels will be provided with drains to insure complete drainage of water within them.

The National Park Service will be notified if any previously unidentified evidence of cultural values are discovered during detailed investigations or construction. The "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R., Part 800) will be followed in complying with Section 106 of Public Law 89-665 and Executive Order 11593. Any needed recovery, protection, and preservation operations will be performed in accordance with the Archeological and Historic Preservation Act (Public Law 93-291). Since this is a federally assisted local project, there will be no change in the existing responsibilities of any federal agency under Executive Order 11593 with respect to archeological and historical resources.

The Arkansas Archeological Survey will be requested to survey any additional areas required for construction roads or borrow areas.

Structure locations are shown on Figure 3, Project Map. More detailed information on quantities, costs, and design features is given in Tables 2 and 3.

EXPLANATION OF INSTALLATION COSTS

The total project cost is estimated to be $1,951,600, of which $1,432,480 will be paid from Public Law 566 funds and $519,120 will be borne by other funds. Included in the total costs are $125,900 for land treatment measures and $1,825,700 for structural measures.

Land treatment costs will be shared $18,700 by Public Law 566 funds and $107,200 by other funds. Public Law 566 funds will provide $3,000 for technical assistance to accelerate installation of the land treatment program administered by the Soil Conservation Service through the going conservation program and $9,000 for soil surveys. Other funds provide $5,600 for technical assistance through the regular program of Public Law 46.

The estimated costs of the forest land treatment measures for the watershed are $75,300. Of this amount, $6,700 are Public Law 566 funds and $68,600 are from other sources. The Public Law 566 funds provide for accelerated technical assistance for private lands. The Arkansas Forestry Commission will provide $1,700 as their share of the accelerated technical assistance.

The going Cooperative Forest Management Program will provide additional technical assistance valued at $500. The landowners and operators will provide $25,800 for installation of land treatment measures.

The U. S. Forest Service estimates that $17,800 will be spent on critical area stabilization measures on national forest lands. An additional $20,300 will be spent for watershed protection forest land treatment measures such as tree planting, woodland management, and thinning.

Cost estimates for installing the forestry phase of the private land treatment program were developed by the U. S. Forest Service and Arkansas Forestry Commission. The technical assistance costs are based on the present costs of the going Cooperative Forest Management Program. Installation costs are based on current prices for the establishment of similar measures in the locale. Recommended forest land treatment measures needed on private and national forest lands to meet treatment goals were developed from a field survey of the watershed and were adjusted for expected landowner participation during the installation period.

Structural measures costs will be shared $1,413,780 by Public Law 566 funds and $411,920 by other funds.

All costs of Floodwater Retarding Structures Numbers 2 and 3 were allocated solely to flood prevention. The cost of the additional storage to minimize adverse impacts downstream was allocated and shared in the same manner as the floodwater retarding structures. Public Law 566 funds will pay all construction and installation services costs of these structures. The Montgomery County Conservation District, through the South Fork Improvement Project Area, will provide land rights costs involved in the installation of these structures.

The Use of Facilities Method was used to allocate costs between purposes in Multiple Purpose Structure Number 1. This resulted in the allocation of 60.11 percent to flood prevention and 39.89 percent to municipal and industrial water supply. The installation costs of the intake structure and raw water line and all costs associated with obtaining and fencing the buffer zone, required by the Arkansas State Department of Health, were allocated solely to municipal and industrial water supply. Public Law 566 funds will pay all construction and engineering costs allocated to flood prevention. The City of Mount Ida and the Arkansas Soil and Water Conservation Commission will bear all construction and engineering services costs allocated to municipal and industrial water supply. The City of Mount Ida will bear all land rights costs on Multiple Purpose Structure Number 1.

The total construction cost is estimated at $1,339,800. Public Law 566 funds will provide $1,058,559 and the City of Mount Ida will provide $281,241, which includes $114,500 for construction of the intake structure and raw water line and $166,741 for that part of construction cost of Multiple Purpose Structure Number 1 allocated to municipal and industrial water supply.

Engineering services costs are estimated to be $119,600 which includes the direct cost of engineers and other technicians for surveys, investigations, designs, and preparation of plans and specifications for structural measures. This cost will be shared $94,521 by Public Law 566 funds and $25,079 by the City of Mount Ida. The cost to be borne by the City of Mount Ida includes $10,200 for design of the intake structure and raw water line, and $14,879 for that part of the engineering costs of Multiple Purpose Structure Number 1 allocated to municipal and industrial water supply.

Investigations have disclosed that, under present conditions, project measures will not result in the displacement of any person, business, or farm operation. If relocations become necessary, the relocation payments will be shared 73.4 percent by Public Law 566 funds and 26.6 percent by other funds.

Project administration costs estimated at $279,300 will be shared $260,700 by Public Law 566 funds and $18,600 by other funds. These are Public Law 566 and other administrative costs associated with the installation of the structural measures including the cost of contract administration, review of engineering plans prepared by others, government representatives, and necessary inspection services during construction to insure that measures are installed in accordance with the plans and specifications. These costs will be treated as measure costs but will not be considered as applicable to individual purposes served by the measures, nor are they a part of the cost of individual measures. Public Law 566 funds will provide $119,600 for construction inspection, $12,000 for administration of contracts, $9,500 for review of engineering plans prepared by others, and $119,600 for administrative costs. The City of Mount Ida will provide $16,200 for construction inspection associated with installing the intake structure, raw water line, fencing around the buffer zone, and other inspections as necessary during the

installation of the multiple purpose structure. An additional $2,000 will be provided for administrative costs. The Montgomery County Conservation District, through the South Fork Improvement Project Area, will provide $400 for administrative cost.

Land rights costs, estimated at $87,000, include the cost of land, easements, and rights-of-way; road and bridge costs; and legal and survey fees. The City of Mount Ida and the Arkansas Soil and Water Conservation Commission will pay $70,000, which includes $23,080 for the purchase of private land; $845 for legal and survey fees on private land; $1,075 for legal and survey fees on U. S. Forest Service land; $15,000 for road modification; and $30,000 for fencing the buffer zone. The Arkansas Soil and Water Conservation Commission, through the Water Development Fund, in accordance with Act 217, 1969, as amended, will advance $60,000 for land rights costs on Multiple Purpose Structure Number 1 to prevent encroachment on the site. The Montgomery County Conservation District through the South Fork Improvement Project Area will provide $17,000, which includes $11,995 for land, easements, and rights-of-way; $2,000 for road modification; $1,000 for moving a building; $980 for legal fees on private land; and $1,025 for legal fees on U. S. Forest Service land.

The engineer's cost estimate and contingency allowance of 12 percent are considered realistic and provide a reasonable allowance for unexpected costs.

The estimated schedule of obligations for the 5-year project installation period is as follows:

Schedule of Obligations

Fiscal Year	Measures	Public Law 566 Funds (dollars)	Other Funds (dollars)	Total (dollars)
First	Land Treatment	3,740	21,440	25,180
	Engineering Services	22,421	25,079 1/	47,500
	Land Rights Cost	XXX	70,000	70,000
Second	Land Treatment	3,740	21,440	25,180
	Engineering Service	39,800	XXX	39,800
	Construction: Multiple Purpose Structure Number 1	251,259	281,241 2/	532,500
	Land Rights Cost	XXX	12,000	12,000
Third	Land Treatment	3,740	21,440	25,180
	Engineering Services	32,300	XXX	32,300
	Construction: Structure Number 2	445,800	XXX	445,800
	Land Rights Cost	XXX	5,000	5,000
Fourth	Land Treatment	3,740	21,440	25,180
	Construction: Structure Number 3	361,500	XXX	361,500
Fifth	Land Treatment	3,740	21,440	25,180
Subtotal		1,171,780	500,520	1,672,300
Project Administration		260,700	18,600	279,300
Total		1,432,480	519,120	1,951,600

1/ Includes estimated advance of $11,159 for deferred engineering services costs.

2/ Includes estimated advance of $125,056 for deferred construction costs.

This schedule may be adjusted from year to year on the basis of any significant changes in the plan found to be mutually desirable and in the light of appropriations and accomplishments actually made.

EFFECTS OF WORKS OF IMPROVEMENT

Flood Prevention, Erosion, and Sediment

The proposed project will reduce flooding on the 1,606-acre flood plain. The flood plain represents the area which would be inundated by a flood having an average frequency of occurence of once in 100 years. The average annual area flooded will be reduced 62 percent, from 1,434 acres to 539 acres. The variation by reaches of the average annual area flooded is as follows:

Reach	Location	Average Annual Area Flooded: Without Project (acres)	Average Annual Area Flooded: With Project (acres)	Reduction (percent)
I	Watershed Outlet to Arkansas Highway 379 Bridge	750	321	57
II	Arkansas Highway 379 Bridge to Structures Numbers 2 and 3	684	218	68
Total		1,434	539	62

The following table lists the reduction in acres flooded by reaches for the 1-year, the 3-year, and the 25-year frequency floods.

Frequency	Reach	Without Project (acres)	With Project (acres)	Reduction (percent)
1-year	I	308	133	57
	II	306	100	67
Total		614	233	62
3-year	I	479	294	39
	II	374	223	40
Total		853	517	39
25-year	I	799	514	36
	II	516	312	40
Total		1,315	826	37

The following table lists the effects of the project on discharges and elevations of various frequency floods at two locations in the flood plain.

Reach	Location	Flood Frequency	Discharge			Elevation		Reduction in Stage (feet)
			Without Project (cfs)	With Project (cfs)	Reduction (cfs)	Without Project (feet msl)	With Project (feet msl)	
I	Highway 270 Bridge	1-Year	4,220	2,200	2,020	624.7	622.8	1.9
		3-Year	7,840	4,200	3,640	626.7	624.7	2.0
		25-Year	16,700	9,140	7,560	629.5	627.2	2.3
II	Highway 379 Bridge	1-Year	3,730	1,600	2,130	667.9	665.8	2.1
		3-Year	7,070	3,010	4,060	669.8	667.3	2.5
		25-Year	15,200	6,170	9,030	673.0	669.3	3.7

With the project installed, damages from a flood similar to the May 1968 flood (approximately a 50-year frequency event) would be reduced about 55 percent. Four residential properties, one industrial property, and one commercial property would be subject to flooding in Mount Ida. Damages would be reduced 45 percent to roads and bridges, 39 percent to crops and pasture, and 51 percent to other agricultural properties.

The area flooded by a 100-year frequency flood in Mount Ida will be reduced from 41 acres to 27 acres, or 34 percent. Flooding on the area adjacent to Mount Ida will be reduced from 112 acres to 43 acres, or 62 percent. Damage to 11 properties within the city limits would be reduced from $14,440 to $3,060, a reduction of 79 percent. Six properties adjacent to Mount Ida would have damages reduced from $17,005 to $1,600, a reduction of 94 percent.

The project will eliminate flooding from floods of less than a 12-year frequency. Six residences or businesses will still be subject to damage from a 100-year frequency flood after project installation. Five of these properties are within the city limits of Mount Ida, and one is in the flood plain adjacent to Mount Ida.

Land within the remaining flood plain will continue to be used for agricultural production.

Gross erosion in the watershed will be reduced 18 percent, and sheet erosion rates on woodland and grassland will be reduced 19 percent and 26 percent, respectively. Flood plain scour damages will be reduced 62 percent.

Sediment yield from the watershed uplands will be reduced 17,400 tons per year or 49 percent by land treatment and structural measures.

Stream pollution caused by sediment will be reduced about 49 percent by the project. The present average annual sediment concentration of 188 milligrams per liter will be reduced to about 96 milligrams per liter at the point where South Fork Ouachita River enters Lake Ouachita.

Twenty-five farms in the flood plain will benefit from flood reduction.

Land use and crop yields, as projected by the Economic Research Service, were used as guides in determining future conditions. Projected land use in the flood plain is shown in the following table for "without project" and "with project" conditions for major land uses.

Projected Flood Plain Land Use	Without Project (acres)	With Project (acres)
Cropland	301	401
Grassland	1,225	1,125
Miscellaneous	80	80
Total	1,606	1,606

The reduction of the flood threat will allow 214 acres to be restored to its former productivity. This land has been in cropland or hayland in the past, but due to flooding has been allowed to return to an unmanaged condition of native grasses.

More intensive land use will occur on 1,145 acres of land in the flood plain as a result of the reduction of damaging floods. This will be the result of more production inputs, such as seed and fertilizer, and the use of more profitable crops.

Benefits derived from increased production from surplus crops on new lands were not used for economic justification of the project. Bringing new land into production or increasing agricultural production on new land is not a primary purpose of the project.

Production losses as a result of inundation by sediment pools is estimated to be about $2,840, which includes grassland ($2,120), and forest land ($720). This will be a permanent loss, as this area is reserved for sediment storage during the life of the project.

Production losses on land required for the embankments, emergency spillways and offsite borrow areas are estimated to be about $1,750, which includes grassland ($1,290), and forest land ($460). These areas will be revegetated and fenced for controlled grazing. Production gains under this land use may equal or exceed losses resulting from construction of the structures.

Water Supply

The present population served by the water system in Mount Ida is approximately 819, with a demand rate (peak daily usage including commercial and industrial) of 244 gallons per capita per day, as reported by the city's engineering consultant.

The municipal and industrial water storage provided by this project will enhance the potential of the area for future industrial development, both in seeking new industry and expanding existing enterprises. A Rural Water

Users Association is planning to install a water distribution system to serve about 200 families.

Runoff from the drainage area above the municipal and industrial water supply site will provide a dependable yield of high quality water to meet projected needs. The expected population equivalent to be served by the year 2020 is 7,275, with a demand rate (peak daily usage including commercial and industrial) of 275 gallons per capita per day, as projected by the city's engineering consultant.

The quantity of water available as stream flow will be reduced until the pools of the structures are filled. After the reservoirs are filled, the quantity will be reduced by seepage and evaporation losses from the pools.

The water quality will not be greatly affected by the structures. During low flow periods (July, August, and September) most or all of the out flow from Structures Numbers 2 and 3 will pass through cool water intakes and low flow ports. This measure should insure that low flow discharge temperatures are approximately the same as inflow temperatures. The absence of developments in the drainage areas of the structures and the fact that most of this land is in the Ouachita National Forest, where development is restricted, indicates that the quality of water will remain in its present state.

Fish and Wildlife and Recreation

Approximately 5 miles of stream fish habitat will be permanently inundated by the three structures. Structures Numbers 1 and 3 will inundate sections with intermittent flow. Structure Number 2 will inundate a reach with perennial flow.

Approximately 193 acres of lake fish habitat will be created by the three structures. Twelve farm ponds will create six additional acres of lake fish habitat.

All of the structures will release water, and flow characteristics downstream from the structures will be similar to present flow conditions. Structure Number 2 is located on a perennial stream and flow will remain perennial.

Water released from the low-flow augmentation pool of Structure Number 3 and the municipal and industrial water pool of Structure Number 1 will change the flow characteristics downstream from the structure locations on these streams from intermittent to perennial flows.

Wildlife habitat in the construction area will be disturbed. After construction, 116 acres will be grassland (embankments, emergency spillways and borrow areas), and 193 acres will be water. This total of 309 acres supports about 25 annual man-days of hunting.

The installation of structural measures will cause an increase in available habitat for fish and wildlife species such as bluegill sunfish, largemouth bass, channel catfish, bullfrog, diamond-backed water snake, red-eared turtle, wood duck, pied-billed grebe, belted kingfisher, beaver, raccoon, and big brown bat. There will be a decrease in available habitat for such species as stoneroller, paleback darter, Kiamichi shiner, redfin darter, creek chub, central dusky salamander, northern fence lizard, speckled kingsnake, ovenbird, brown thrasher, pine warbler, flying squirrel, pine vole, and gray squirrel.

These reservoirs will alter some habitat of the paleback darter and Kiamichi shiner, two rare species which could possibly be in the watershed. The colorless shiner is another rare species which could be in the watershed, but is not expected to be affected by the planned reservoirs. This shiner prefers a river habitat with slow or quiet water (16); such habitat is downstream from the reservoir sites.

Archeological and Historical Resources

Based upon a survey by the Arkansas Archeological Survey, the potential direct impact of the project, from an archeological perspective, would not destroy any resources. If unidentified archeological sites are disturbed during construction, their values will be partially or completely lost.

Economic and Social

The project will serve as an immediate stimulus to the local economy by providing new employment opportunities. The employment multiplier was used to measure the total effect of creating additional employment. The multiplier was derived from the occupational classifications of the employed labor force. Basic data for estimating the number of jobs created by the project were obtained from OBERS projections and from U. S. Census of Population, Arkansas, 1970.

The analysis indicates that 36 new jobs will be created by providing employment opportunities for local labor during the construction period. In addition, there will be 38.3 new jobs associated with basic and derivative industries that will continue after construction is completed.

The effect of the project is particularly significant due to the high rate of unemployment and underemployment in the local area. The use of local labor for operation and maintenance of the project will provide a continuing favorable effect on the local economy. Loss of agricultural production in the pool areas will cause a minor loss of agricultural income.

Additional income will be received by the laborers employed during construction and by farmers from the increased sales of farm products as a result of damage reduction and agricultural enhancement. The increased purchase of items or services required to produce and market the expanded production represents new income to local farm supply dealers, transporters, and processors.

Storage is included in Multiple Purpose Structure Number 1 for municipal and industrial water for the City of Mount Ida. This municipal and industrial water storage will enhance the potential of the area for future industrial development, both in seeking new industry and expanding existing enterprises.

The additional income generated by the project will enable the community to better support new or improved schools, parks, roads, health facilities, and other projects that will add to the enjoyment of life.

Knowledge of the protection afforded by the project will give the residents a greater sense of security. Families can offer their children greater incentives to continue their education and remain in the community. The family-farm pattern of agriculture will be strengthened, which will help maintain population stability.

Installation of the South Fork Watershed Project will help achieve the goals of both the West Central Arkansas Planning and Development District and the Ozarks Economic Development Region by increasing employment, raising per capita income, and improving the standards of living for residents of the area.

PROJECT BENEFITS

The estimated average annual monetary floodwater, sediment, scour, and indirect damages (Table 5) within the watershed will be reduced from $98,970 to $29,020 by the proposed project. This is a reduction of 71 percent, 95 percent of which will result from the installation of structural measures.

Annual flood reduction benefits will accrue as follows:

Crop and Pasture	$22,630
Other Agricultural	5,040
Nonagricultural	
Road and Bridge	11,630
Urban	11,380
Sediment (Overbank Deposition)	3,000
Erosion	5,720
Indirect	10,550
Total 1/	$69,950

1/ Of this amount, land treatment measures will provide flood reduction benefits of $3,230 annually.

The general location of damage reduction benefits attributed to the combined program of land treatment and structural measures is presented in the following tabulation:

Evaluation Reach 1/	Location	Without Project (dollars)	With Project (dollars)	Reduction (percent)
I	Watershed outlet to Arkansas Highway 379 Bridge	61,260	18,540	70
II	Arkansas Highway 379 Bridge to Structures Numbers 2 and 3	37,710	10,480	72
Total		98,970	29,020	71

1/ Location of the evaluation reaches are shown on the Project Map (Figure 3).

The reduction in frequency and depth of flooding will permit farmers to increase the aggregate annual income an estimated $14,310. Increased farm income will be brought about by improving cultural practices, fertilizing, and converting low income producing land to better uses. These benefits from a more intensive use of the flood plain were adjusted to allow for the appropriate lag in accrual. Restoration of land to its former productivity amounts to $8,990 annually; this amount is included in the crop and pasture benefits.

Since Montgomery County has been designated under the Public Works and Economic Development Act of 1965 as an area of serious and chronic unemployment, redevelopment benefits were used for project justification. Benefits amounting to $13,770 will accrue annually by providing employment for the unemployed and the underemployed during installation of the project and from operation and maintenance of the structural measures during a 20-year period.

The average annual municipal and industrial water supply benefits accruing to the multiple-purpose structure are estimated to be $34,830. These benefits were determined from cost data supplied by the consulting engineer for the City of Mount Ida, Arkansas.

Secondary benefits from a national viewpoint were not considered pertinent to the economic evaluation of this project. Locally, secondary benefits, including increased business activity and improved economic conditions in the adjoining communities, will result from the installation of the complete project.

Project installation will permit farmers in the watershed to plan their cropping systems with a reasonable sense of security against flooding. These improved conditions will tend to stabilize employment in businesses associated with agriculture and promote the economic well-being of the inhabitants of the area. Local secondary benefits amounting to $12,200 annually were used for project justification.

The evaluated monetary benefits accruing to structural measures are shown in Table 6.

COMPARISON OF BENEFITS AND COSTS

The average annual cost of the structural measures (amortized installation cost plus operation and maintenance) is $109,420. The installation of the structural measures is expected to produce average annual primary benefits of $129,630. Primary benefits will provide $1.18 for each dollar of cost.

The ratio of total benefits ($141,830) to total annual cost ($109,420) is 1.3:1 (Table 6).

PROJECT INSTALLATION

The watershed project is planned for a 5-year installation period. Land treatment measures will be established throughout the entire period by landowners and operators, in cooperation with the Montgomery County Conservation District. The District, with additional assistance from the Soil Conservation Service and the Arkansas Forestry Commission, in cooperation with the U. S. Forest Service, will assist with planning and application of these measures. Assistance will be accelerated to assure application of planned conservation measures within the project installation period. The Soil Conservation Service will provide additional technical assistance for land use determination, planning and application of conservation measures.

Landowners having forest land will be encouraged to apply and maintain forestry measures on their forested lands. The U. S. Forest Service, by and through the Arkansas Forestry Commission, will provide technical assistance in the planning and application of forest land treatment measures in the watershed. They will provide additional technical assistance for accelerating the installation of forestry measures. A forester trained in watershed management will be assigned to this project to guide and assist the landowners in the installation of planned forestry measures.

The Montgomery County Conservation District will assume active leadership in establishing the land treatment program. District directors will schedule meetings and through contacts will encourage landowners and operators to establish a complete soil and water conservation program.

The Montgomery County Agricultural Stabilization and Conservation Committee will cooperate with the governing body of the conservation district by selecting those Rural Environmental Conservation Program practices which will accomplish the conservation objectives in the shortest possible time.

The Cooperative Extension Service will assist with the educational phase of the program by conducting general information and local farm meetings; preparing radio, television, and press releases; and using other methods of conveying information to the watershed landowners and operators.

The Montgomery County Conservation District will make a concerted effort to interest local landowners in establishing additional wildlife food and cover plants that will benefit quail, deer, rabbit, wild turkey, and dove.

The Mount Ida City Council will be responsible for restricting additional development within the city limits of Mount Ida that will be subject to flooding from a 100-year storm. The Montgomery County Conservation District will discourage additional urban development in the flood area outside the city limits.

Structural measures will be installed during the second, third, and fourth years of the project installation period.

The South Fork Improvement Project Area of the Montgomery County Conservation District, the City of Mount Ida, and the Arkansas Soil and Water Conservation Commission, have the necessary authority to discharge local responsibility.

The U. S. Forest Service will install the land treatment measures planned on national forest lands with supplemental and regularly appropriated funds. Program accomplishment is contingent on the availability of Forest Service funds for this purpose.

Installation of structural measures will be contingent upon the following conditions:

(1) Conservation agreements covering 50 percent or more of the private land in the drainage area above each detention reservoir have been developed prior to installation of structural measures.

(2) All land rights have been obtained for all structural measures, or a substantial part has been obtained and a written statement has been furnished by the South Fork Improvement Project Area of the Montgomery County Conservation District and the City of Mount Ida, Arkansas, that the right of eminent domain will be used if necessary, to secure the remainder within the project installation period and that sufficient funds are available for this purpose.

(3) Installation of critical area treatment measures above floodwater retarding structures must be scheduled before or concurrently with the structural measures.

(4) The South Fork Improvement Project Area of the Montgomery County Conservation District and the City of Mount Ida, Arkansas, are prepared to discharge their responsibilities as set forth in this plan for installation of all structural measures.

(5) Project agreements have been executed.

(6) Operation and maintenance agreements have been executed.

(7) The Mount Ida City Council will have issued an ordinance prior to the installation of structural measures to restrict future urban development in the area subject to flooding from the 100-year storm after project installation.

(8) Special use permits for all structure sites, borrow areas and roads located on national forest land have been obtained by the sponsors.

The construction plans and specifications for Multiple Purpose Structure Number 1 will be prepared by a consulting engineer through a negotiated A&E contract let by the Soil Conservation Service.

The Soil Conservation Service has been requested to administer the contracts and will provide all other technical assistance in design, preparation of contract payment estimates, final inspections, execution of certificates of completion, and related tasks for the establishment of planned structural measures.

FINANCING PROJECT INSTALLATION

Federal assistance will be provided under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Statute 666), as amended. This assistance is subject to the appropriation of funds.

The cost of land treatment measures will be financed by landowners and operators with assistance from Federal and/or State programs. Public Law 566 funds will be provided for technical assistance to accelerate the installation of land treatment measures. Public Law 566 funds and Cooperative Forest Management Program funds will provide the technical assistance necessary to install forest land treatment measures on private forest lands.

Costs involved in the application of private forest land treatment measures, other than those borne by Public Law 566 funds, will be provided by the landowners and operators. Public Law 566 funds will provide for technical assistance to accelerate the installation of these measures.

The U. S. Forest Service estimates that $40,600 will be used for land treatment measures on national forest lands.

The Montgomery County Conservation District through the South Fork Improvement Project Area has the power under State law to secure and repay loans, assess benefits, levy taxes, and provide the funds needed to meet their obligations in the installation of Structures Numbers 2 and 3. The district plans to obtain a watershed loan to finance their share of the project installation cost. A letter of intent to borrow has been filed with the Farmers Home Administration. Funds for the repayment of this loan will be obtained from taxes levied on the benefited area.

The City of Mount Ida and the Arkansas Soil and Water Conservation Commission, through the Water Development Fund, in accordance with Act 217, 1969, as amended, will purchase land rights for Multiple Purpose Structure Number 1. The City of Mount Ida will assume the local share of all remaining costs necessary to install, operate, and maintain Multiple Purpose Structure Number 1. Public Law 566 funds, not to exceed 30 percent of the installation cost of the structure, will be advanced to pay the construction and engineering services costs allocated to the 1,014 acre-feet of future water supply. Repayment by the City of Mount Ida will begin when the water is first used, or ten years after the structure is completed, whichever occurs first (estimated advance, $136,215). The City of Mount Ida will execute an agreement for the repayment of the advance approved by the Farmers Home Administration before a project agreement for construction is executed. The State Director of the Farmers Home Administration has tentatively concurred in the City of Mount Ida's ability to repay this advance. The City of Mount Ida will make an application to the Arkansas Soil and Water Conservation Commission for additional funds needed for the installation of Multiple Purpose Structure Number 1. Funds to repay the loans and to operate and maintain Multiple Purpose Structure Number 1 will be paid from water and sewer revenues collected by the City of Mount Ida. The City of Mount Ida intends to use the 1,014 acre-feet of future municipal and industrial water storage within the life of the structure.

PROVISIONS FOR OPERATION AND MAINTENANCE

Land treatment measures will be maintained by the landowners and operators in cooperation with the Montgomery County Conservation District. Representatives of the district and the Soil Conservation Service will make periodic inspections of land treatment measures and the district will encourage farmers to perform needed maintenance.

The landowners and operators will maintain the forest land treatment measures on the private land under agreement with the Montgomery County Conservation District.

The Arkansas Forestry Commission, in cooperation with the U. S. Forest Service, will furnish the technical assistance necessary for operating and maintaining the forest land treatment measures under the going Cooperative Forest Management Program. The U. S. Forest Service will maintain the land treatment measures on national forest land in accordance with the multiple use and sustained yield management principals. Forest fire protection is provided by the Forest Service on national forest lands and by the Arkansas Forestry Commission through the going Cooperative Fire Control Program on private lands.

Multiple Purpose Structure Number 1 will be operated and maintained by the City of Mount Ida at an estimated annual cost of $1,000. Funds for operation and maintenance will be obtained from the city water revenues. All applicable state and local laws will be followed in the operation of the structure.

The operation plan for Multiple Purpose Structure Number 1 provides that the withdrawal of municipal and industrial water storage for present use will be in the range of 735.7 to 730.5 feet mean sea level during the first ten years after the date of completion of this structure. It will be the responsibility of the City of Mount Ida to notify the Soil Conservation Service State Conservationist whenever the structure is to be operated below the specified range. Municipal water will not be withdrawn below the elevation 730.5 feet mean sea level until arrangements for repayment of the advance are completed.

Floodwater Retarding Structures Numbers 2 and 3 will be operated and maintained by the Montgomery County Conservation District, through the South Fork Improvement Project Area, at an estimated annual cost of $800. Funds for operation and maintenance will be obtained from taxes levied on the benefited area. Maintenance will be performed with contributed labor, district-owned equipment, by contract or force account, or a combination of these methods.

The Soil Conservation Service and the sponsors will make a joint inspection annually, after unusually severe floods, or in the event of other unusual conditions that may adversely affect the works of improvement, for three years following installation of each structure. Inspection after the third year will be made annually by the sponsors.

Annual maintenance will be needed to maintain an adequate vegetative cover on earthfills, vegetated emergency spillways, and borrow areas. During the life of the structure, it may be necessary to do major repair work to restore concrete that has deteriorated; replace gates, trash racks, or other metal works; remove and/or stabilize slide material; and replace eroded material and revegetate the emergency spillways. Fences will be maintained until there is mutual agreement that they are no longer needed to protect structural works of improvement.

Immediately following completion of the structures by the contractor, the appropriate sponsors will be responsible for and promptly perform, or have performed, without cost to the Soil Conservation Service, all maintenance of the structural measures as determined to be needed by either the sponsors or the Soil Conservation Service.

The sponsors will be responsible for maintenance of vegetation associated with structural measures after the initial vegetation work is adequately completed, as determined by the Soil Conservation Service, but no later than three years following completion of each structural measure.

The Soil Conservation Service, through the Montgomery County Conservation District, will participate in operation and maintenance only to the extent of furnishing technical assistance to aid in inspections and technical guidance and information necessary for the operation and maintenance program.

Provisions will be made for free access for representatives of the sponsoring local organizations and of Soil Conservation Service representatives to inspect and provide for maintenance of all structural measures and their appurtenances at any time. The sponsoring local organizations will maintain a record of all maintenance inspections and maintenance performed and have them available for review by the Soil Conservation Service.

The sponsors fully understand their obligations for maintenance and will execute specific operation and maintenance agreements prior to the issuance of invitations to bid on the construction of the structural measures. This operation and maintenance agreement will contain a reference to the Soil Conservation Service publication "State of Arkansas Watersheds Operations and Maintenance Handbook," and an operation and maintenance plan will be prepared for the structural measures. The operation and maintenance agreement will include specific provisions for retention and disposal of property acquired or improved with Public Law 566 financial assistance. All work will meet the requirements of Act 81 of the Arkansas General Assembly of 1957, as amended, which authorizes the Division of Soil and Water Resources to issue permits for construction of dams, inspect construction, and make annual operation and maintenance inspections after construction. The sponsor will be required to follow the Division's recommendations on needed maintenance work.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

South Fork Watershed, Arkansas

Installation Cost Item	Unit	Number: Fed. Land	Number: Non-Fed. Land	Number: Total	Estimated Cost (Dollars) 1/: P. L. Funds: Federal Land: SCS 3/	P. L. Funds: Federal Land: FS 3/	P. L. Funds: Non-Federal Land: SCS 3/	P. L. Funds: Non-Federal Land: FS 3/	P. L. Funds: Total	Other: Federal Land: SCS 3/	Other: Federal Land: FS 3/	Other: Non-Federal Land: SCS 3/	Other: Non-Federal Land: FS 3/	Other: Total	TOTAL
LAND TREATMENT															
Land Areas 2/															
Cropland	Acre	-	400	400	-	-	-	-	-	-	-	4,800	-	4,800	4,800
Grassland	Acre	-	2,000	2,000	-	-	-	-	-	-	-	28,200	-	28,200	28,200
Forest Land	Acre	1,700	1,200	2,900	-	-	-	-	-	-	20,300	-	25,800	46,100	46,100
Critical Area Stabilization															
Roadbank	Mile	37	-	37	-	-	-	-	-	-	5,900	-	-	5,900	5,900
Gulley, Streambank, and Sheet Erosion	Acre	17	-	17	-	-	-	-	-	-	11,900	-	-	11,900	11,900
Technical Assistance	-	-	-	-	-	-	3,000	6,700	9,700	-	2,500	5,600	2,200 4/	10,300	20,000
Soil Survey	Acre	28,800	16,051	44,851	5,760	-	3,240	-	9,000	-	-	-	-	-	9,000
TOTAL LAND TREATMENT	XXXX	XXXX	XXXX	XXXX	5,760	-	6,240	6,700	18,700	-	40,600	38,600	28,000	107,200	125,900
STRUCTURAL MEASURES															
Construction															
Multiple Purpose Structure Number 1 5/	No.			1	193,469	-	57,790	-	251,259	216,556	-	64,685	-	281,241	532,500
Floodwater Retarding Structures Numbers 2 & 3 5/	No.			2	526,560	-	280,740	-	807,300	-	-	-	-	-	807,300
Subtotal - Construction					720,029	-	338,530	-	1,058,559	216,556	-	64,685	-	281,241	1,339,800
Engineering Services					64,296	-	30,225	-	94,521	19,311	-	5,768	-	25,079	119,600
Relocation Payments					-	-	-	-	-	-	-	-	-	-	-
Project Administration															
Construction Inspection					83,607	-	35,993	-	119,600	12,474	-	3,726	-	16,200	135,800
Other					99,306	-	41,794	-	141,100	1,848	-	552	-	2,400	143,500
Subtotal - Administration					182,913	-	77,787	-	260,700	14,322	-	4,278	-	18,600	279,300

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST (continued)

South Fork Watershed, Arkansas

Installation Cost Item	Number			Estimated Cost (Dollars) 1/										
				P. L. Funds					Other					
				Federal Land		Non-Federal Land			Federal Land		Non-Federal Land			
	Unit	Fed. Land	Non-Fed. Land	SCS 3/	FS 3/	SCS 3/	FS 3/	Total	SCS 3/	FS 3/	SCS 3/	FS 3/	Total	TOTAL
Other Costs														
Land Rights				-	-	-	-	-	1,800	-	85,200	-	87,000	87,000
Subtotal - Other				-	-	-	-	-	1,800	-	85,200	-	87,000	87,000
TOTAL STRUCTURAL MEASURES				967,238	-	446,542	-	1,413,780	251,989	-	159,931	-	411,920	1,825,700
TOTAL PROJECT				972,998	-	452,782	6,700	1,432,480	251,989	40,600	198,531	28,000	519,120	1,951,600

1/ Price base 1974.
2/ Includes only areas estimated to be adequately treated during the project installation period. Treatment will be accelerated throughout the watershed, and dollar amounts apply to total land areas, not just adequately treated areas.
3/ Federal agency responsible for assisting in installation of works of improvement.
4/ Includes $500 for going Cooperative Forest Management Program.
5/ Both federal and non-federal lands are involved in each of the structures. Costs were divided between federal and non-federal lands on the basis of the amounts of each type land involved.

April 1974

TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT

(at time of work plan preparation)

South Fork Watershed, Arkansas

Measures	Unit	Applied to Date	Total Cost (Dollars) 1/
LAND TREATMENT MEASURES			
Conservation Cropping Systems	Acre	32	82
Contour Farming	Acre	9	14
Crop Residue Management	Acre	30	75
Brush Management	Acre	1,200	6,000
Pasture and Hayland Planting	Acre	325	11,375
Pasture and Hayland Management	Acre	400	800
Proper Grazing Use	Acre	400	400
Stabilization of Old Roads and Trails	Mile	20	1,600
Tree Planting and Seeding	Acre	530	10,600
Release Thinning	Acre	1,700	60,000
Cooperative Forest Fire Control Program	Acre	16,040	16,040
Diversion	Feet	5,000	350
Pond	Number	36	18,000
Total		XXX	125,336

1/ Price Base: 1974

TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION

South Fork Watershed, Arkansas

(Dollars) 1/

Item	Installation Cost - Public Law 566 Funds			Installation Cost - Other Funds				Total Installation Cost
	Construction	Engineering	Total P. L. 566	Construction	Engineering	Land Rights	Total Other	
Multiple Purpose Structure Number 1	251,259	22,421	273,680	166,741	14,879	14,000 2/	195,620	469,300
Intake Structure and Raw Water Line	-	-	-	114,500	10,200	-	124,700	124,700
Buffer Zone	-	-	-	-	-	56,000 3/	56,000	56,000
Subtotal	251,259	22,421	273,680	281,241	25,079	70,000	376,320	650,000
Floodwater Retarding Structures:								
Number 2	445,800	39,800	485,600	-	-	12,000 4/	12,000	497,600
Number 3	361,500	32,300	393,800	-	-	5,000 5/	5,000	398,800
Subtotal	807,300	72,100	879,400	-	-	17,000	17,000	896,400
Project Administration	XXX	XXX	260,700	XXX	XXX	XXX	18,600	279,300
GRAND TOTAL	1,058,559	94,521	1,413,780	281,241	25,079	87,000	411,920	1,825,700

1/ Price Base 1974.
2/ Includes $5,000 for road modification, $235 for legal and survey fees on private land, and $875 for legal and survey fees on U. S. Forest Service land.
3/ Includes $10,000 for road modification, $30,000 for fencing, and $810 for legal and survey fees.
4/ Includes $2,000 for county road modification, $430 for legal fees on private land, and $750 for legal and survey fees on U. S. Forest Service land.
5/ Includes $1,000 for moving one building (Hunting Club), $550 for legal fees on private land, and $275 for legal and survey fees on U. S. Forest Service land.

TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

South Fork Watershed, Arkansas

(Dollars) 1/

Item	COST ALLOCATION			COST SHARING					
	PURPOSE			Public Law 566			OTHER		
	Flood Prevention	M&I Water	Total	Flood Prevention	M&I Water	Total	Flood Prevention	M&I Water	Total
Multiple Purpose Structure No. 1	282,095	187,205	469,300	273,680	-	273,680	8,415	187,205	195,620
Intake Structure and Raw Water Line	-	124,700	124,700	-	-	-	-	124,700	124,700
Buffer Zone 2/	-	56,000	56,000	-	-	-	-	56,000	56,000
Floodwater Retarding Structures Structures Numbers 2 and 3	896,400	-	896,400	879,400	-	879,400	17,000	-	17,000
GRAND TOTAL	1,178,495	367,905	1,546,400	1,153,080	-	1,153,080	25,415	367,905	393,320

1/ Price Base 1974.
2/ Includes costs for land, fencing, and road modification.

April 1974

TABLE 3 - STRUCTURAL DATA - STRUCTURES WITH PLANNED STORAGE CAPACITY

South Fork Watershed, Arkansas

Item	Unit	Structure Numbers 1	2	3	Total
Class of Structure		b	b	b	XXXXX
Drainage Area	Sq. Mi.	5.62	13.96	6.86	26.44
Curve No. (1-day) (AMC II)		74	74	74	XXXXX
Elevation Top of Dam	Ft.	760.0	824.0	860.0	XXXXX
Elevation Crest Emergency Spillway	Ft.	751.0	808.8	849.9	XXXXX
Elevation Crest Single Stage Inlet	Ft.	735.7	775.4	826.1	XXXXX
Elevation Crest Ungated Port	Ft.	-	768.1	822.0	XXXXX
Maximum Height of Dam	Ft.	86	85	68	XXXXX
Volume of Fill	Cu. Yds.	287,759	280,079	240,148	807,986
Total Capacity 1/	Ac. Ft.	3,389	5,159	2,766	11,314
Sediment Submerged	Ac. Ft.	234	670	340	1,244
Sediment Aerated	Ac. Ft.	36	97	51	184
Augmentation	Ac. Ft.	-	-	180	180
Municipal & Industrial Water Supply	Ac. Ft.	1,352	-	-	1,352
Retarding	Ac. Ft.	1,767	4,392	2,195	8,354
Surface Area					4/
Sediment Pool 2/	Acres	(22)	56	(38)	56
Augmentation Pool	Acres	-	-	50	50
M&I Water Supply Pool	Acres	87	-	-	87
Retarding Pool 1/	Acres	152	240	149	541
Principal Spillway					
Rainfall Volume (areal)(1-day)	In.	9.2	9.0	9.2	XXXXX
Rainfall Volume (areal)(10-day)	In.	15.3	15.2	15.3	XXXXX
Runoff Volume (10-day)	In.	8.9	8.8	8.9	XXXXX
Capacity of Single Stage (Maximum)	cfs	131	301	193	XXXXX
Frequency Operation - Emer. Spillway	% chance	2	2	2	XXXXX
Dimensions of Conduit	In.	30	42	36	XXXXX
Emergency Spillway					
Rainfall Volume (ESH)(areal)	In.	9.3	9.1	9.3	XXXXX
Runoff Volume (ESH)	In.	6.1	5.9	6.1	XXXXX
Storm Duration	Hrs.	6	6	6	XXXXX
Type		Rock	Rock	Rock	XXXXX
Bottom Width	Ft.	100	100	100	XXXXX
Velocity of Flow (Ve)	Ft./Sec.	2.43	3.50	- 3/	XXXXX
Slope of Exit Channel	Ft./Ft.	0.040	0.040	0.017	XXXXX
Maximum Water Surface Elevation	Ft.	751.4	809.5	849.9	XXXXX
Freeboard					
Rainfall Volume (FH)(areal) 5/	In.	20.0	19.5	20.0	XXXXX
Runoff Volume (FH)	In.	16.3	15.9	16.3	XXXXX
Storm Duration	Hrs.	6	6	6	XXXXX
Maximum Water Surface Elevation	Ft.	759.7	823.6	859.7	XXXXX
Capacity Equivalents					
Sediment Volume	In.	0.90	1.03	1.07	XXXXX
Retarding Volume	In.	5.90	5.90	6.00	XXXXX
Augmentation Volume	In.	-	-	0.49	XXXXX
M&I Water Supply Volume	In.	4.51	-	-	XXXXX

1/ At crest of Emergency Spillway.
2/ Area shown in () for reservoirs with augmentation or M&I water supply storage.
3/ No flow during passage of hydrograph.
4/ Total does not include areas in ().
5/ Exceed minimum volume.

April 1974

TABLE 4 - ANNUAL COST

South Fork Watershed, Arkansas

(Dollars) 1/

Evaluation Unit	Amortization of Installation Cost 2/	Operation and Maintenance Cost	Total
Multiple Purpose Structure Number 1, Intake Structure and Raw Water Line, and Buffer Zone	38,320	1,000	39,320
Floodwater Retarding Structures Numbers 2 and 3	52,840	800	53,640
Project Administration	16,460	XXX	16,460
GRAND TOTAL	107,620	1,800	109,420

1/ Price Base: 1974.

2/ 100 years @ 5-7/8 percent interest.

TABLE 5

ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

South Fork Watershed, Arkansas

(Dollars) 1/

Item	Estimated Average Annual Damage		Damage Reduction Benefits
	Without Project	With Project	
Floodwater			
Crop and Pasture	30,840	8,210	22,630
Other Agricultural	7,300	2,260	5,040
Non-Agricultural			
Road and Bridge	15,870	4,240	11,630
Urban			
Residential	2,880	140	2,740
Commercial	930	20	910
Industrial	10,630	2,900	7,730
Subtotal	68,450	17,770	50,680
Sediment			
Overbank Deposition	3,850	850	3,000
Erosion			
Flood Plain Scour	12,160	6,440	5,720
Indirect	14,510	3,960	10,550
TOTAL	98,970	29,020	69,950

1/ Price Base: Crop and pasture current normalized prices; all other 1974 prices.

TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

South Fork Watershed, Arkansas

(Dollars)

Evaluation Unit	Average Annual Benefits 1/						Average Annual Cost 3/	Benefit Cost Ratio
	Damage Reduction	More Intensive Land Use	Municipal Water Supply	Redevelopment	Secondary	Total		
Multiple Purpose Structure Number 1 and Floodwater Retarding Structures Numbers 2 and 3	66,720	14,310	34,830	13,770	12,200	141,830	92,960	1.5:1
Project Administration	XXX	XXX	XXX	XXX	XXX	XXX	16,460	XXX
GRAND TOTAL	66,720 2/	14,310	34,830	13,770	12,200	141,830	109,420	1.3:1

1/ Price Base: Crop and pasture benefits current normalized prices; all other benefits 1974 prices.

2/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of $3,230 annually.

3/ From Table 4.

INVESTIGATIONS AND ANALYSES

Land Treatment

The Conservation Needs Inventory and other field office resource information provided data on land capabilities and conservation needs for the watershed.

Land treatment measures already applied and the cost per unit of application for each measure were obtained from field office records and from farm operators. This information was used in preparing Table 1A.

A systematic field survey showed ground cover, forest and hydrologic conditions, and treatment needs. This survey, supporting data, and information from other agencies was used to determine the amount of remedial measures. The recommended forest land treatment measures will contribute to flood reduction and soil stabilization.

All land treatment measures to be applied during the project installation period were determined on the basis of the need for treatment for watershed protection and flood prevention and the level of participation expected from landowners and operators.

Consideration was given to the personnel available for planning and the resources of farm operators for providing their share of funds for installing the land treatment measures.

Engineering

A base map of the watershed was prepared to show the watershed boundary, drainage pattern, system of roads, and other pertinent information.

Structure locations were determined from quadrangle maps and field examination. All sites were surveyed by the rangeline method. Topographic maps with 4-foot contour intervals were developed on aerial photographs with a scale of 1 inch = 660 feet. Stage-storage curves and stage-surface area curves were developed from these contour maps.

The heights of the dams and the sizes of the pools were determined by the storage volumes needed to control the runoff from the design storms and to provide additional storage for sediment, municipal and industrial water at Multiple Purpose Structure Number 1, and low-flow augmentation at Structure Number 3.

Construction costs were based on unit prices being expended at similar sites, Soil Conservation Service experience, and values furnished by local organizations. Each structure was analyzed to determine the least costly combination of emergency spillway and embankment.

Six potential structure sites were investigated. Another multiple purpose structure (municipal and industrial water supply) was studied on Williams Creek, but was eliminated because the drainage area above the site was densely populated, increasing the chance for pollution and high land rights costs.

The engineering report on Multiple Purpose Structure Number 1 and Mount Ida Water Supply was prepared by Mehlburger Engineers, Inc., Little Rock, Arkansas.

A summary of physical data is shown on Table 3.

Geologic

Preliminary geologic investigations were made on each floodwater retarding structure site and the multi-purpose site. These investigations included studies of stratigraphy, structural geology, lithology, borrow materials, and depths of overburden at the sites.

Bedrock underlying the watershed is sedimentary strata of Cambrian and Ordovician ages. Rock types are mostly hard shale and sandstone with minor amounts of limestone. Formations include the Collier Shale, Crystal Mountain Sandstone, Mazarn Shale, Blakely Sandstone, Womble Shale, Polk Creek Shale, and Bigfork Chert.

The watershed is located in the Ouachita Mountains, which constitute a complexly folded anticlinorium in which Cambrian rocks are exposed near the crest. The watershed is situated near the axis of the Ouachita Mountain uplift. Close folding throughout the area is indicated by narrow ridges and valleys which generally follow east-west trending structural axes.

Structure Number 1 is located on Mazarn Shale and Crystal Mountain Sandstone, Structure Number 2 is located on Mazarn Shale, and Structure Number 3 is located on Collier Shale. All three damsites, which are underlain by competent bedrock at shallow depths, appear to have sufficient foundation strength for the proposed embankments.

The emergency spillways of all three structures will contain moderate amounts of sandstone and shale which will classify as rock excavation. Well-cemented, durable rock occurs at emergency spillway crest elevations in all three structure sites.

Borrow materials occur in alluvial deposits in the pool areas and in residual deposits in offsite borrow areas. All three structure sites will require that a portion of the embankment material be obtained from outside of the permanent pool.

Mineral resources in the watershed include limestone, slate, and quartz crystals. Limestone is found in the watershed in limited quantities. Limestone was mined at the Pipkin Quarry in the central portion of the watershed until 1951. A crushing plant at the quarry supplied roadstone, chat, and agricultural limestone. An estimated measurable reserve of 100,000 tons of limestone remains in the quarry. Limited quantities of slate are available in the Mazarn Shale or Womble Shale in the southern part of the watershed. The chief use of the slate is in roofing granules. Quartz veins are present in the Crystal Mountain and Blakely Sandstones in the Ouachita Mountains. The most productive zones to date are found outside of the watershed and quartz mining in the watershed has been limited to hand diggings and exploration. The quartz has been used for gem materials, mineral collections, tourist trade, optical equipment, and electrical oscillators (4).

Sedimentation

Sediment sources were located and evaluated by field mapping methods. Soil cover complex and erosion studies were conducted on a representative portion of the upland area of the watershed. The basic erosion rate for each land use was determined from detailed investigation. The present and projected erosion and sedimentation rates were computed for each structure site. Delivery ratios of sediment from sheet erosion losses to the reservoirs are estimated to range from 37 percent to 42 percent, depending primarily upon drainage area size. Submerged sediment in the reservoirs will have a density of approximately 50 pounds per cubic foot, and the aerated sediment will be deposited at a density of about 85 pounds per cubic foot.

Sediment and scour damages on the flood plain were mapped by measuring each type of damage by use of aerial photographs and field investigation. The area and intensity of the damages were computed from data collected in the field. Damages were summarized by type, percent, and reach number.

Hydraulic and Hydrologic

Climatological records are available from an Environmental Data Service gage at Mount Ida. Temperatures and precipitation amounts have been recorded at this location for 72 years.

A continuous-record station to measure streamflow was maintained on South Fork Ouachita River in Mount Ida from June 1949 to September 1970. The gage, operated by the U. S. Geological Survey, was converted to a crest-stage partial-record station in September 1970.

Evaporation records are available at Russellville where an evaporation station has been maintained for 28 years.

Aerial photographs, watershed base maps, and quadrangle maps provided basic topographic information. Forty-five valley sections were surveyed to obtain additional data concerning topography and land use.

Land use and cover conditions on agricultural land for future conditions were estimated with the help of the District Conservationist. Cover conditions on all woodland were determined by the U. S. Forest Service.

Runoff curve numbers were computed for each structure's drainage area and the uncontrolled area. Consideration was given to such factors as soils, topography, land use, and cover conditions. This procedure is outlined in the Soil Conservation Service National Engineering Handbook, Section 4, Hydrology. The computed curve numbers were used to determine runoff for present and future conditions.

The 45 valley sections were used to determine elevation-discharge and elevation-area inundated relationships in the watershed. Computations were made on an IBM-1130 computer.

The frequency method was used for evaluation routings. Rainfall volumes for storms having a 24-hour duration were obtained from U. S. Weather Bureau Technical Paper 40. Six storms were used in the routings. Runoff volumes for each rainfall amount were determined using the computed runoff curve numbers. All evaluation routings were made on the computer. Routed peak discharges were compared with gage records to insure that the peak discharge-frequency relationship was valid.

Four structural alternates were routed during the evaluation process. The alternates consisted of (1) present conditions, (2) six structures, (3) five structures, and (4) four structures. The proposed project of three structures was obtained by the elimination of a tributary to the watershed, Williams Creek.

Output from the evaluation routings was used as input for the economic evaluation. Economic evaluations were also made with the computer.

The extent of flooding in Mount Ida was determined from water surface profiles in the urban area for the various frequency storms routed during project evaluation. The depth of flooding in each of the homes and businesses was determined for each storm for each structural alternate. Elevations of all buildings subject to flooding were obtained by field surveys.

Floodwater detention storage was determined by routing principal spillway hydrographs. Rainfall volumes were taken from the U. S. Weather Bureau Technical Papers 40 and 49. Routings were made on the computer and were performed in accordance with criteria set out in Engineering Memorandum SCS-27.

Emergency spillway and freeboard hydrographs were routed on the computer, using procedures outlined in Section 4 of the SCS National Engineering Handbook. The rainfall volumes were determined from maps included in Arkansas Watersheds Memorandum AK-301, and freeboard hydrograph volumes exceed those volumes found in Chapter 21 of Section 4 of the SCS National Engineering Handbook.

The consulting engineer for the City of Mount Ida furnished a report showing present and projected populations, water requirements, and costs of the proposed municipal and industrial water supply. A series of water budgets was made on the computer to check various demand rates and storage volumes, and to determine the adequacy of the proposed water supply.

It was determined from a series of water budgets made on all the structures that the additional water to be stored for streamflow augmentation should be included in Structure Number 3. This volume (180 acre-feet) will be stored and released through an orifice located at the elevation of the 100-year sediment pool. The water will augment streamflow except during periods of extreme drought.

Water will be released from Structure Number 2 through an orifice located at the elevation of the 50-year sediment pool. The principal spillway riser will be constructed to the elevation of the 100-year sediment pool, and the structure will release water except during periods of drought.

Economic

Damage schedules were taken in the flood plain. These schedules covered historical information on flooding and flood damage. Land use and crop yield projections were obtained from River Basin Studies made by the Economic Research Service. Land use and crop yield projections, supplemented by the information contained in the schedules, served as a guide for determining damage rates for depth and season of flooding.

A future "without project" and future "with project" approach was taken in this evaluation. Land use and crop yields were used as guides in determining future "without project" conditions. The land use and crop yield projections for the South Fork Watershed are based on soils in the flood plain, which are comparable to those used in other River Basin studies. Crop and pasture damages were adjusted for recurrent flooding.

The frequency method was used throughout the analysis of floodwater damages. All floodwater damages were calculated for future "without project" conditions and for conditions expected to prevail after installation of the project measures. The difference between damage remaining after installation and the damage before installation constitutes the benefit.

Damages to the urban area and to the roads and bridges are items of nonagricultural damages in the watershed. Estimates were obtained from people who knew of the damage caused to these items by flooding.

A total of four systems of structural measures was analyzed. The system which gave the most effective flood prevention program for the costs involved was used for project justification.

The monetary value of physical damage to the flood plain from scour and sediment deposition was based on lost production. Lag in recovering productivity and cost of farm operations to speed recovery was taken into consideration.

Indirect damages consist primarily of extra travel time to market, interrupted travel, later deliveries, loss of business, and loss of employment. It is estimated that indirect damage amounts to at least 15 percent of the direct damages.

Analysis of land use and crop yields in conjunction with other available information, indicates that there will be restoration of former productivity and more intensive use in the flood plain after project installation. The magnitude of these benefits is discussed on page 42 of this plan.

Storage of water for municipal and industrial use was included as a purpose in this work plan. The use of Facilities Method, Section 103.021 of the Watershed Protection Handbook, was used to allocate the cost of this structure between purposes served. The benefit analysis of the municipal and industrial storage was based on a report by the consulting engineer for the City of Mount Ida, Arkansas. These benefits were adjusted to compensate for a 10-year allowance for deferred use. Project installation will provide opportunities for employment of local labor presently unemployed or underemployed. Data from other projects indicate that local labor costs will be approximately 15 percent of the construction costs. This value for the structures was amortized and converted to a redevelopment benefit. The value of local labor employed in project operation and maintenance over a 20-year period was treated as a decreasing annunity and converted to an average value for the project life and used as a second redevelopment benefit.

The analysis of secondary benefits was based on primary benefits stemming from the project, along with the increased costs of producing the additional goods induced by the project. Secondary benefits were considered to be 10 percent of primary, excluding indirect and redevelopment.

Areas that will be inundated by the sediment, municipal and industrial, low-flow augmentation, and detention pools of the structure measures were excluded from the damage appraisal. Lost production in these areas after project installation was compared with the appraised value of the sites.

In the analysis, no production would occur in the sediment pools. Land covered by detention pools was assumed to be converted to grassland under project conditions. Since the value of the easement exceeded the value of lost production, the easement value was used in economic justification.

Details of the procedure used in the investigation are described in the "Economic Guide for Watershed Protection and Flood Prevention".

Fish and Wildlife

A stream survey was conducted on South Fork Ouachita River, and its tributaries on which floodwater retarding structures were planned. Physical parameters measured were pool riffle ratio, average pool size, average pool depth, bottom type, stream shelter, water temperature, and riparian vegetation. Examples of chemical parameters measured were dissolved oxygen, total hardness, total alkalinity, and pH.

In conjunction with the stream survey the land use within the area of each planned sediment pool was recorded. Observations recorded within forest land were species, basal area, and diameters. Dominant grasses, herbs, and shrubs in other land uses were recorded.

Information from files of the Arkansas Game and Fish Commission was used. Examples are Dingell-Johnson reports, county fish population samples, deer harvest records, and turkey harvest records.

Engineering data from "Table 3 - Structural Data" of this work plan, four-foot contour interval maps of improvement sites, and stage-surface area curves were used to predict morphometric characteristics of sediment pools.

Examples are surface area to drainage area ratio, average depth, acres of littoral water, and acres of limnetic area.

Distribution maps from the following texts were used to determine watershed fauna:

1. Key to the Fishes of Arkansas by T. M. Buchanan.
2. A Field Guide to Reptiles and Amphibians by R. Conant.
3. A Field Guide to the Birds by R. T. Peterson.
4. The Mammals of North America, Volume I and II by E. R. Hall and K. R. Kelson.

A decision to store 180 acre-feet of low-flow augmentation water in Structure Number 3 was based on findings from the previously mentioned stream evaluation. The most practical way to minimize adverse impacts of permanently inundating stream fish habitat after impoundment is to improve the quality of the remaining fish habitat downstream from the impoundments. The reach downstream from Structure Number 3 will be benefited more by low-flow augmentation than the reach downstream from Structure Number 2.

LITERATURE CITED

1. Arkansas Department of Labor, Labor Force Statistics Annual Averages, State and Areas. Little Rock, Arkansas, 1971.

2. Industrial Research and Extension Center, State and County Economic Data for Arkansas, Pub. L-2A, Little Rock, Arkansas, 1973.

3. Shaw, Samuel P. and Gordon C. Fredline, Wetlands of the United States, U. S. Department of the Interior, Circular 39, USGPO, Washington D.C., 1971.

4. Stroud, Raymond B., et al, Mineral Resources and Industries of Arkansas, U. S. Department of the Interior, Bulletin 645, USGPO, Washington, D.C., 1969.

5. U. S. Army Corps of Engineers, Water Resources Development in Arkansas, Vicksburg, Mississippi, 1973.

6. United States Bureau of Census, Census of Agriculture, 1969. Volume 1, Area Report 34. Arkansas Section 2, Co. Data, USGPO, Washington, D.C., 1972.

7. United States Bureau of the Census, United States Census of Population, 1970, Number of Inhabitants Final Report, PC(1)-A5 AR, USGPO, Washington, D.C., 1971.

8. United States Department of Agriculture, Land Resource Regions and Major Land Resource Areas, Agricultural Handbook 296, USGPO, Washington, D.C., 1965.

9. United States Department of Commerce, Climatological Data, USGPO, Washington, D.C.

10. Water Resources Council, Water Resources Regions and Subregions for the National Assessment of Water and Related Land Resources. Washington, D.C., 1970.

11. Arkansas Department of Pollution Control and Ecology, National Quality Standards, Little Rock, Arkansas, 1973.

12. United States Department of the Interior, Geological Survey, Water Resource Data for Arkansas, Little Rock, Arkansas, 1972.

13. Arkansas State Department of Health, Rules and Regulations Pertaining to Public Water Supplies, Little Rock, Arkansas, 1971.

14. United States Department of the Interior, Geological Survey, Water - Resources Reconnaissance of the Ouachita Mountains, Arkansas, Geological Survey Water-Supply Paper 1809-J, USGPO, Washington, D.C., 1965.

15. United States Department of the Interior, Geological Survey, Water Supply Characteristics of Selected Arkansas Streams, Water Resources Circular No. 9, Little Rock, Arkansas, 1965

16. Arkansas Department of Planning, Arkansas Natural Area Plan, Little Rock, Arkansas, December 1974, pp 72-75.

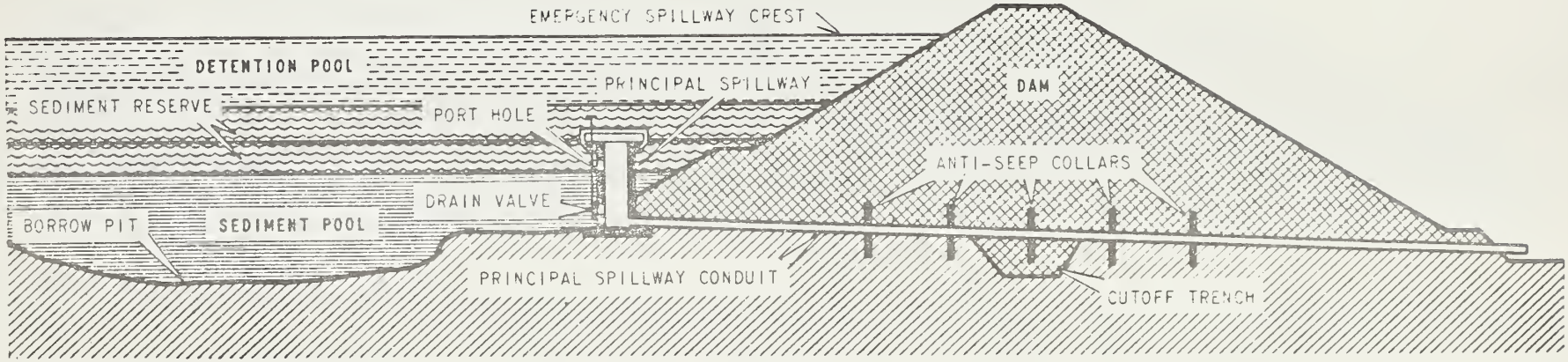


Figure 1

SECTION OF A TYPICAL FLOODWATER RETARDING STRUCTURE

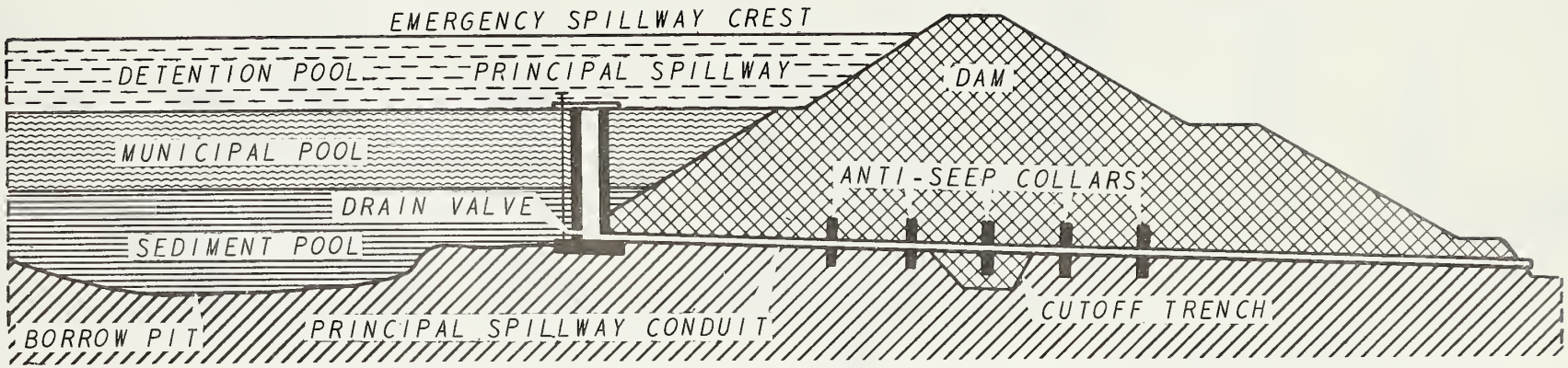
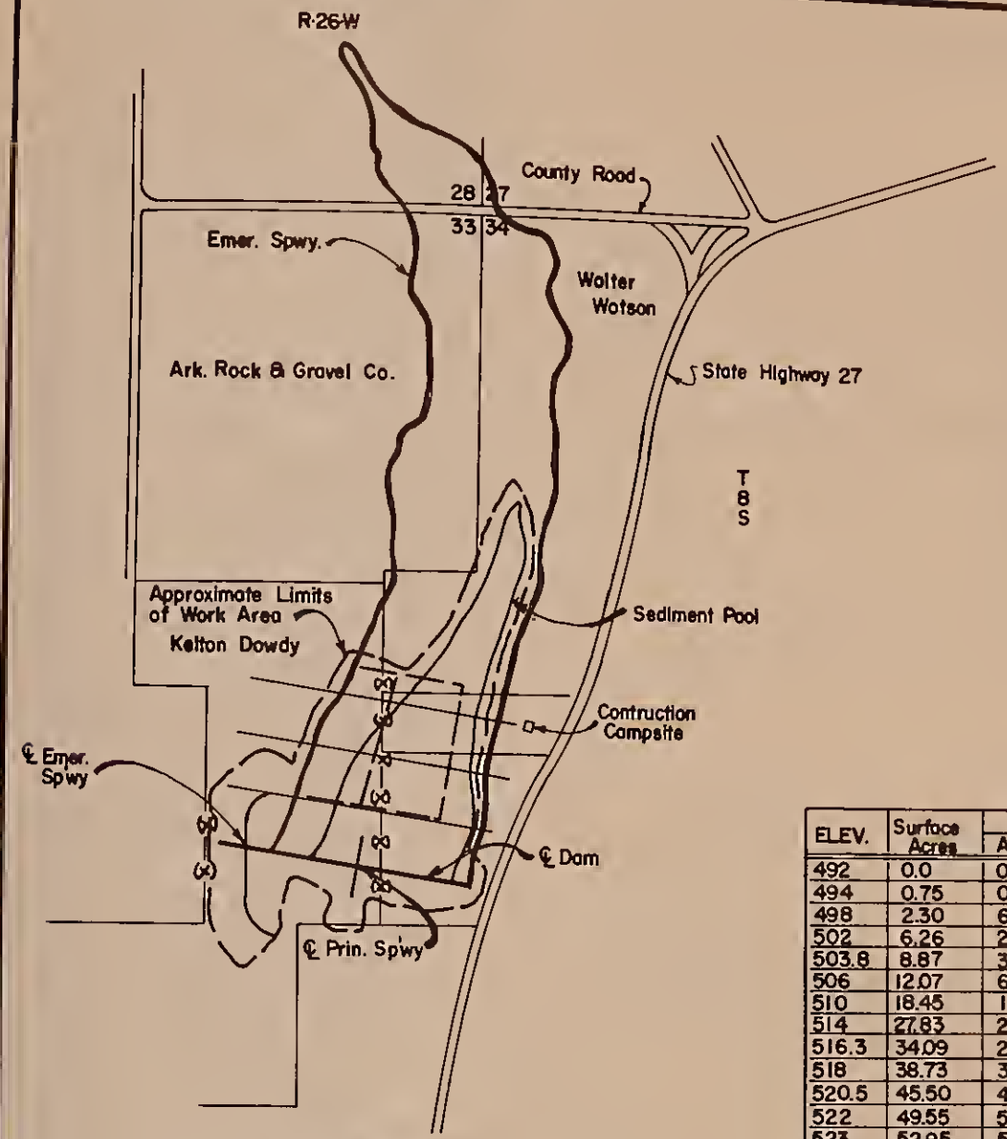


Figure 1A

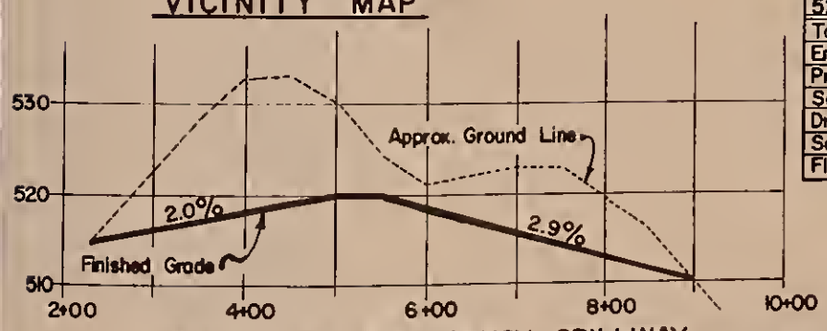
SECTION OF A TYPICAL MULTIPLE PURPOSE STRUCTURE



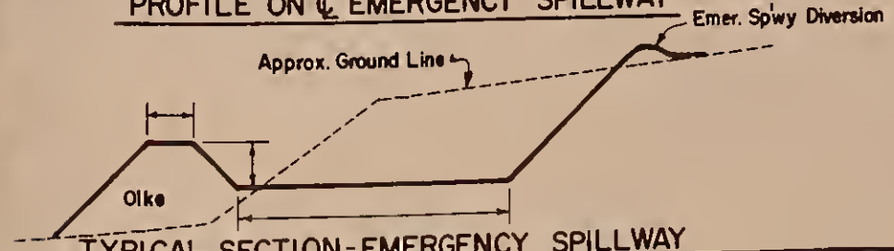
VICINITY MAP

ELEV.	Surface Acres	STORAGE AC.-FT.	STORAGE INCHES
492	0.0	0.0	0.0
494	0.75	0.75	0.01
498	2.30	6.85	0.10
502	6.26	23.97	0.33
503.8	8.87	37.40	0.52
506	12.07	60.57	0.84
510	18.45	121.61	1.69
514	27.83	214.17	2.99
516.3	34.09	285.40	3.97
518	38.73	347.34	4.83
520.5	45.50	447.80	6.22
522	49.55	523.86	7.27
523	52.95	575.11	8.00
524	56.37	629.77	8.74

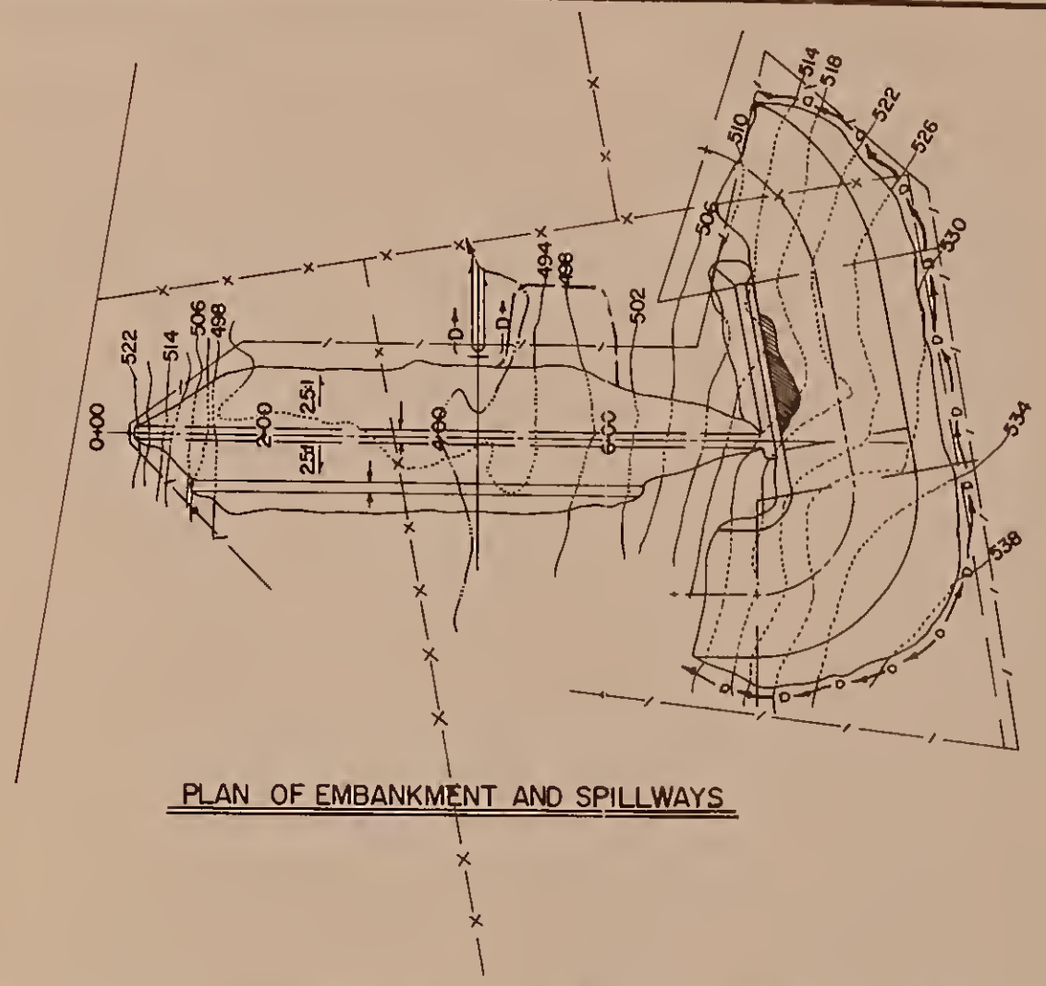
Top of Dam (effective) Elev.	523.5
Emergency Spwy Crest Elev.	520.5
Prin. Spwy Crest Elev.	516.3
Sed. Pool & Port Elev.	503.8
Drainage Area-Acres	864
Sed. Storage-Ac. Ft.	73.40
Floodwater Storage Ac. Ft.	374.4



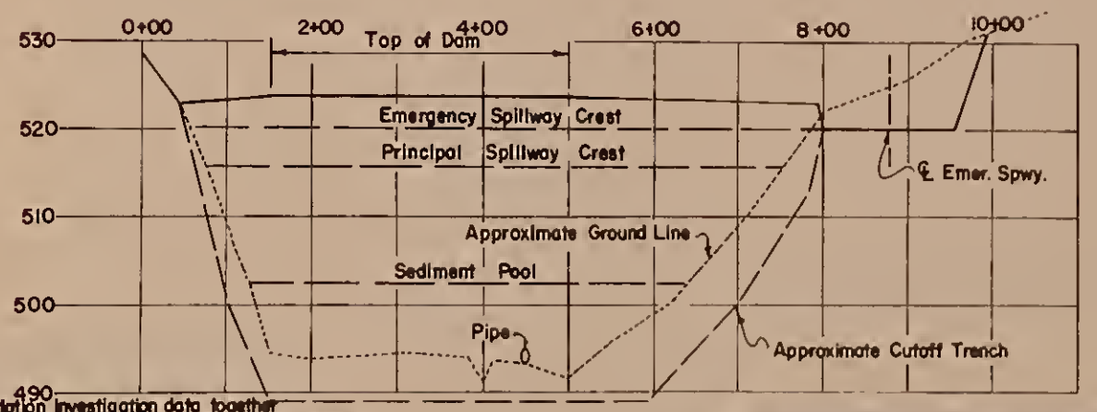
PROFILE ON ℄ EMERGENCY SPILLWAY



TYPICAL SECTION-EMERGENCY SPILLWAY



PLAN OF EMBANKMENT AND SPILLWAYS



PROFILE ON ℄ DAM

Additional soil and foundation investigation data together with laboratory test data are available in S.C.S. field construction office for review by prospective bidders.

Figure 2
TYPICAL
FLOODWATER RETARDING STRUCTURE
GENERAL PLAN AND PROFILE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed
Drawn
Traced
Checked
Approved
State Conservation Engr.
Title
Date
4-L-30711-1

4-30703

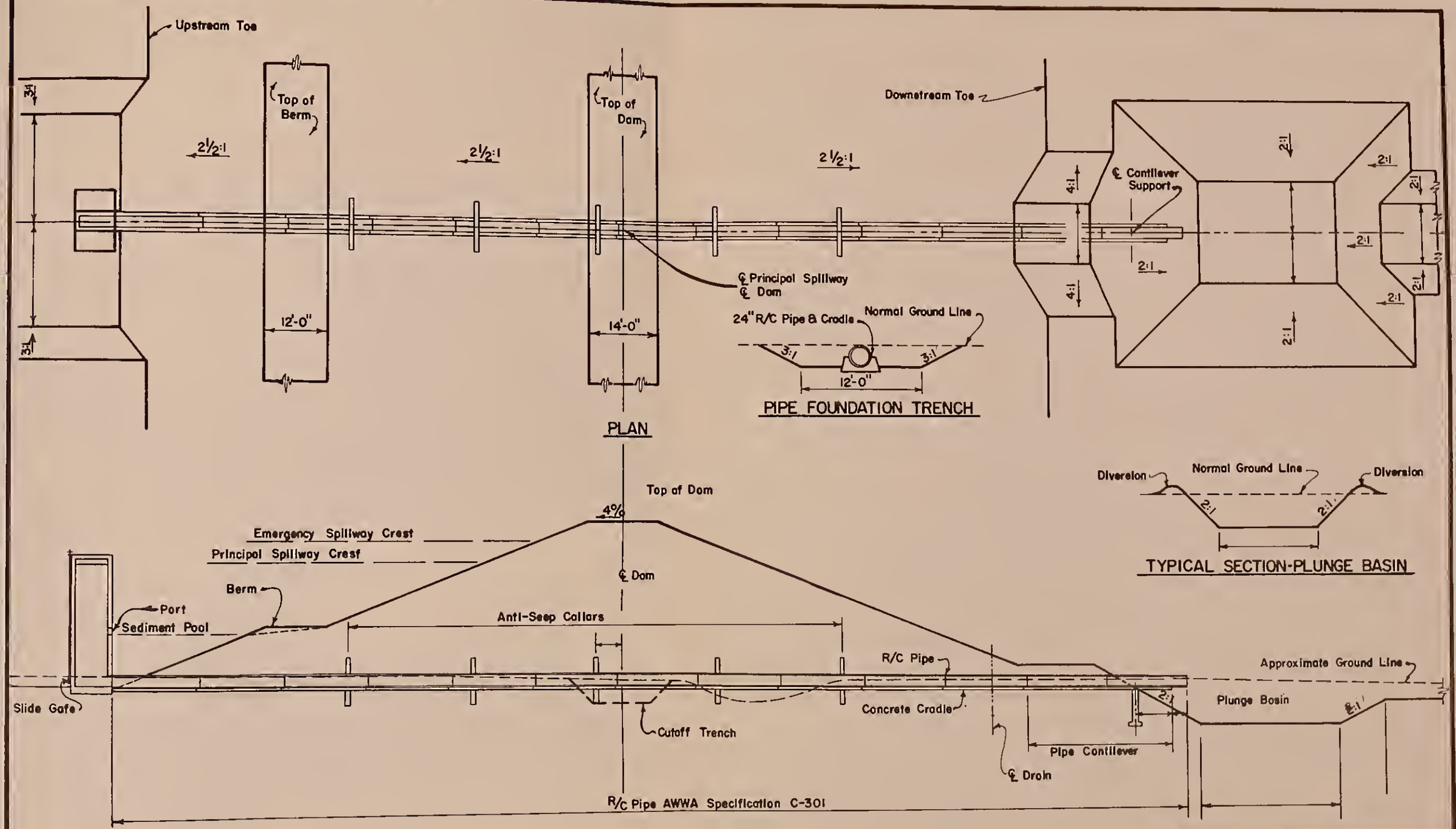


Figure 2a
TYPICAL
FLOODWATER RETARDING STRUCTURE
STRUCTURE PLAN AND SECTION

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date Approved by
Designed State Conservation Engr.
Drawn Title
Traced Sheet No. Drawing No. 4-L-30711-2
Checked

4-30703

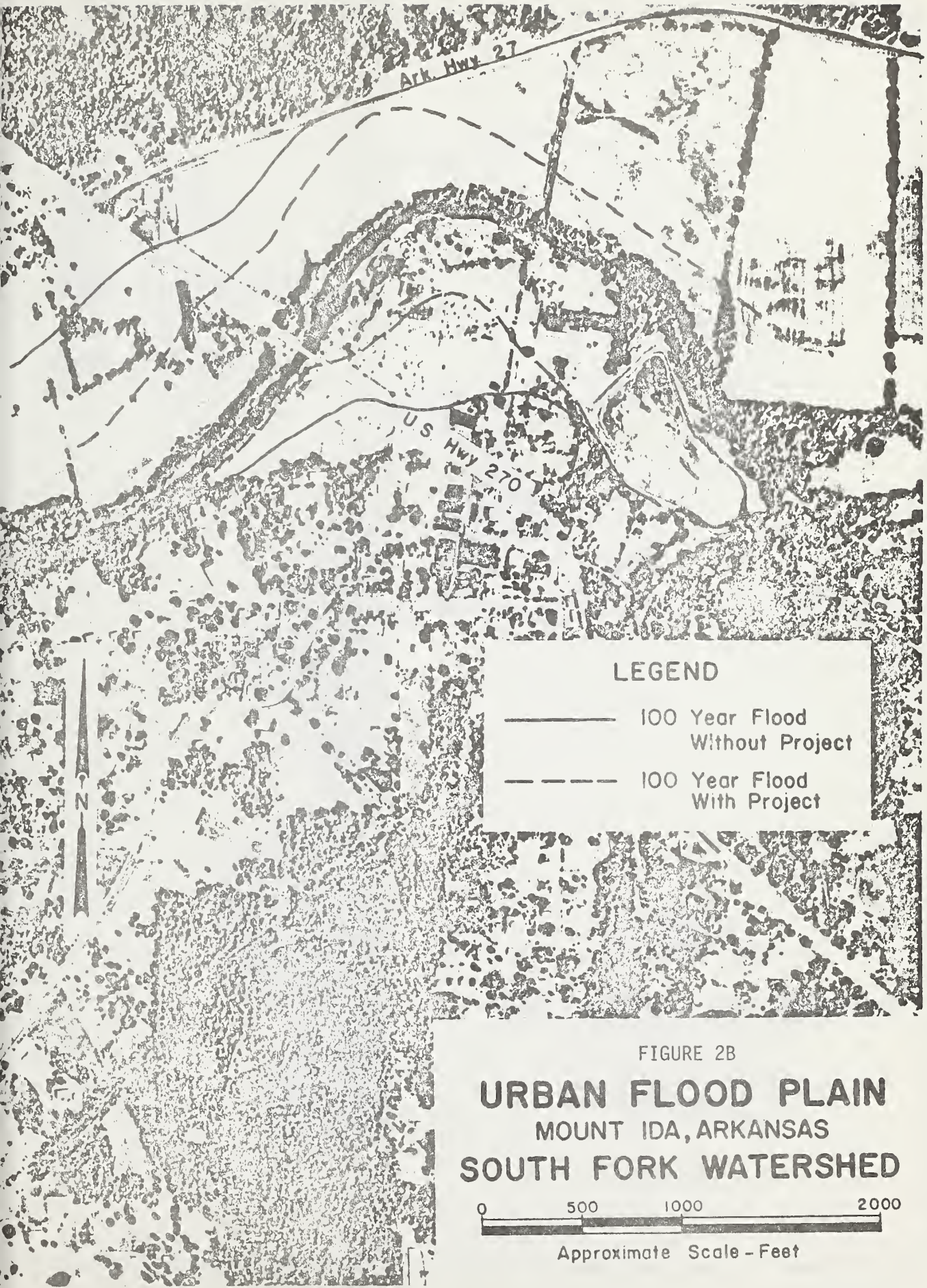


FIGURE 2B

URBAN FLOOD PLAIN

MOUNT IDA, ARKANSAS

SOUTH FORK WATERSHED

0 500 1000 2000

Approximate Scale - Feet

LEGEND

- Paved Road
- Improved Road
- Unimproved Road
- 28 Section Line and Number
- Town or Community
- Drainage
- Ouachita National Forest Land Boundary
- Floodwater Retarding Structure
- Multiple Purpose Structure (M.S.) – Municipal and Industrial)
- ② Structure Number
- Reaches
- Watershed Boundary
- Drainage Area Boundary
- Area Benefited

93°40'
93°45'
93°50'
34°35'
34°30'
R-27-W
R-26-W
R-25-W
R-24-W
T 2 S
T 3 S
REACH I
REACH II
D.A. 6.66 Sq.Mi.
D.A. 5.62 Sq.Mi.
D.A. 13.98 Sq.Mi.
North Fork
South Fork
Big Cedar
Cedar Creek
Ouachita River
Borrow Pit Creek
Woods Branch
MOUNT IDA
ARKANSAS
SOUTH FORK WATERSHED
N

FIGURE 3
PROJECT MAP

SOUTH FORK WATERSHED
MONTGOMERY COUNTY
ARKANSAS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LITTLE ROCK, ARKANSAS

0 1 2 3
Approximate Scale – Miles

Base compiled from latest available U.S.G.S. Quads.

4-R-20450